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HARVARD UNIVERSITY

PAPERS

VOLUME XVII

CAMBRIDGE, MASSACHUSETTS, U.S.A.
PUBLISHED BY THE MUSEUM
1941, 1950

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KRAUS REPRINT CORPORATION
New York
1968

Printed in U.S.A.

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NAVAHO POTTERY MAKING

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OF THE
PEABODY MUSEUM OF AMERICAN ARCHAEOLOGY
AND ETHNOLOGY, HARVARD UNIVERSITY

VOL. XVII—NO. 1

NAVAHO POTTERY MAKING

AN INQUIRY INTO THE AFFINITIES OF NAVAHO PAINTED POTTERY

BY
HARRY TSCHOPIK, JR.

CAMBRIDGE, MASSACHUSETTS, U.S.A
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PREFACE

THE field studies upon which this report is based were made possible by financial assistance from the Division of Anthropology of Harvard University. I wish to express my gratitude to Professor Hooton and to Professor Tozzer for their interest and support, and I am also grateful to Mr. Donald Scott, Director of the Peabody Museum, for many favors granted. To Dr. Clyde Kluckhohn, under whose direction the research was done, I am indebted for many helpful criticisms and suggestions in addition to material which he generously supplied from his own field notes.

I wish to thank Mr. E. W. Gifford for access to his unpublished field material on Navaho pottery manufacture and also for photographs of vessels in the Museum of Anthropology of the University of California. Mr. Juan Dolores kindly furnished me with descriptions of these.

For additional pottery photographs and descriptions I am indebted to Mr. Gordon C. Baldwin and Mr. F. H. Douglas; to Dr. N. C. Nelson for making available for study Navaho vessels in the American Museum of Natural History, and to Mr. C. O. Turbyfill and the Museum of the American Indian, Heye Foundation.

Thanks are due Mr. L. T. MacKinney, Custodian at Chaco Canyon National Monument, for permission to photograph and study his collection of Navaho pottery. To Mr. R. Van Valkenburgh I am indebted for the opportunity of visiting several interesting archaeological Navaho sites in the vicinity of Fort Defiance, Arizona, and for the use of some of his data on Navaho pottery manufacture.

To Dr. W. W. Hill I am indebted for the opportunity to include some of his unpublished notes on Navaho pipe making and usage. To Drs. Leslie Spier and William Duncan Strong, Messrs. Kenneth M. Chapman, J. O. Brew, W. S. Stallings, Marshall T. Newman and Mrs. Dorothy Keur I am grateful for helpful criticisms and suggestions.

Dr. L. C. Wyman of Boston University kindly identified the plant specimens, while Mr. G. Switzer made the proper mineral analyses.

To Miss Marion Lambert, Mr. F. P. Orchard, Mr. John Adair, Mr. Gordon Vivian, Mr. J. Robert Jones and Mr. M. A. Wilder, I wish to express thanks for photographs of Navaho vessels. The drawings were made by Mr. Elmer Rising.

For their generous hospitality, I wish to express my most sincere thanks to Mr. and Mrs. B. M. Williamson, Mr. and Mrs. Robert R. Budlong, and to Mr. and Mrs. Evon Vogt and family.

Finally, I am indebted to Miss Katherine Spencer and to my wife, Marion Hutchinson Tschopik, who undertook the most unpleasant task of all, the preparation of the manuscript.

H. Tschopik, Jr.

Cambridge, Massachusetts
December 18, 1939

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INTRODUCTION

INTRODUCTION

THE present report grew out of general ethnographical studies conducted among the Ramah-Atarque Navaho during the summers of 1937 and 1938. While working primarily within the sphere of material culture in this small, conservative Navaho community—which is located in west central New Mexico, just to the east of the Zuñi reservation, and roughly between the towns of Ramah and Atarque—it was discovered that several of the older women still remembered the techniques of painted pottery manufacture. Indeed, it is only within the last ten years or so that pottery making in this region has ceased as an active craft. Since many Southwestern anthropologists have talked and operated as if the Navaho had never made painted pottery, it seemed desirable to make a detailed study while the facts were still available. Since some misconceptions seem still to exist with regard to the utility ware, occasion has been taken also to consider some aspects of this problem.

The first portion of the report presents the technological details of pottery manufacture as these were actually observed in the field. The observations were then supplemented, in so far as was possible, by interview material. Perhaps to some, this portion of the account may seem unnecessarily repetitious and overburdened with details; however, I am inclined to agree with Hill that "from the point of view of tracing various forms of cultural growths and influences and for comparative purposes, it is an essential factor that these minute details be included".[1] Where the opinions of informants are in conflict, the various accounts have been presented in full with little attempt at evaluation; adequate bases for such generalizations and evaluations are lacking at the present time. In organizing and presenting the technological aspects of Navaho pottery making, I acknowledge freely the influence of Guthe's masterful presentation in his account of pottery manufacture at the pueblo of San Ildefonso.[2]

In part II of this report, an attempt has been made to relate Navaho pottery manufacture within the general cultural and social context in which it existed and was once a part.[3] The social considerations seem to me to be of vital importance, since it is in the teacher-learner relationship and in the inherent associations which exist between the potter and her craft that we may expect to discover indications of the mechanisms and processes which lead to change in ceramic styles.

In part III have been presented the details relating to the manufacture of the ritual pipes for use in song ceremonials and in ritual hunting. Since the latter subject has received but slight treatment in the existing literature, additional material on pipe usage has been included.

In the last section of the report, I have attempted to coordinate observed pottery technology with other accounts which are to be found in the literature and then to correlate these findings with actual Navaho specimens in the collections of various museums. It is important that photographs of these should be made available as comparative material to the archaeologist, since it seems most unlikely, due to the very nature of Navaho economy, that large collections of whole specimens will ever be recovered archaeologically.

Finally, an attempt has been made to demonstrate the diversity of technological patterns and regional variations in Navaho ceramics, and then to relate Navaho pottery making techniques to those employed by other pottery making Southwestern groups in order to discover, by comparative methods, the probable affinites of Navaho pottery manufacture.[4]

Throughout, informants are referred to by number. The same numbers have been and will be employed consistently by Dr. Kluckhohn and myself to designate these individuals in all future studies relating to the Ramah-Atarque area.

---

[1] Hill, 1938, p. 3.

[2] Guthe, 1925.

[3] In order to avoid expensive phonetic type setting, clans have here been designated by means of Reichard's clan numbers. Reichard, 1928, pp. 11–13.

[4] Following Hill, the territory occupied by the Navaho has been divided into three geographical regions, Eastern, Central, and Western (1938, pp. 4–5; p. 12, fig. 1). The Ramah group has been treated here as a separate sub-area.

INFORMANTS

1—Dick Pino
2—Jake
3—Solao
5—Margadito
7—Bidaga
12—Dave Skeet
14—Hastin Martin's wife
15—Juanita Natan
24—Acho
32—Solao's wife
36—Dave Skeet's wife
39—José Leon
40—Pedro Bieber
169—Old Lady Cojo
192—José Martin's mother

INTERPRETERS

Dave Skeet
Tucson Samuels

PART I

TECHNOLOGY

PART I. TECHNOLOGY

TRADITIONAL SHAPES AND USAGES

TWO major styles of pottery were manufactured by the Ramah-Atarque Navaho in the "old days":[1] (1) an unpainted cooking ware which embodied certain characteristic shapes; (2) a painted ware, rather more variable than the latter and, it is postulated, of more recent origin.

The Navaho themselves distinguish three principal types of vessels: (1) *ʔása·ʔ*, "cooking pot"; (2) *łe·ċa·ʔ*, "bowl"; (3) *tóʔazis* or *tósǯe·h*, "water bottle" (14, 15, 32, 192).[2] In addition to these basic forms and their variations, several other objects of pottery were manufactured: ladles or dippers, crucibles, pipes, and crude figurines. Hill states that cups and pitchers were manufactured, but that these forms seem to have been of recent innovation.[3] Informants 32 and 192 were in agreement with this point of view.[4] Specimens of pitchers and cups, presumably of modern manufacture, are illustrated in plates XII, e; XIII, j; XIV, b; XV, a. Hill states in addition that shallow, undecorated pottery trays, which were designated by the same name as the bowls, were formerly used for parching and as food containers.[5] These seem not to have been manufactured in the Ramah area (15, 32, 192).[6]

Within this three-fold classification by means of which the Navaho categorize their own vessels, further distinctions are made on the basis of size, shape, breadth, usage, and the manner in which the vessel is decorated. A small cooking pot, *ʔása·ʔ yáž*, is differentiated from one of ordinary size by adding the suffix *-yáž* or *-yáží*, "small" (15, 32, 192) (fig. 1, c, f). Conversely, a cooking pot of unusual size (fig. 1, a) is called *ʔása·ʔ coh* "big cooking pot" (32, 192). The designation of a particular type of vessel by means of its shape may be illustrated by the term *tósǯe·h nómazí*, "round water bottle," (fig. 2, g, g′). The term *ʔása·ʔ télí*, "wide pot" (fig. 1, g–i), characterizes a cooking vessel of more than average breadth (15, 32, 36, 192). Occasionally the term *ʔása·ʔ tósǯe·h*, literally "cooking pot, water gummed," is employed to designate the pottery water bottle, and also to distinguish it from the pitch-covered basket, *k̓į·ʔ tósǯe·h*, "sumac, water gummed" (15, 32). Similarly, a dipper of pottery may be referred to as *hašƛ̓iš ʔade·ʔ*, "mud dipper" (fig. 1, j–l), in order to differentiate it from a dipper made of a gourd, *ʔade·ʔ* (15, 32, 192).[7] The cooking pot that is to be used as a drum is designated as to its use by the term *ʔása·ʔ dádíƛ̓ó·hí*. Similarly, the vessel used as a milking receptacle was designated *ʔása·ʔ bi·ʔi·níhí*, "pot to milk in" (12, 36). Distinctions based on the manner of decoration vary in the degree to which they are specific. The term *łe·ċa·ʔ bík̓ʔeščį* specifies a decorated bowl—although the type of decoration is not indicated—as opposed to the generic word for bowl, *łe·ċa·ʔ*, which carries no inherent implication of decoration (12, 32, 192). On the other hand, *ʔade·ʔ žiní* designates specifically a dipper which is black in color (7, 32).

---

[1] This period to which the older informants allude comprises the last three decades of the nineteenth century and the first of the present century. Specifically, in the Ramah area, it refers to the years immediately following the termination of the captivity at Fort Sumner.

[2] In order to eliminate the expensive setting of phonetic type, the translations given throughout this section will be used whenever there is occasion to refer to these vessels.

According to informants 32 and 192, the two words for "water bottle" may be used interchangeably. Informant 15, however, maintained that *tóʔazis* is a new word, not in use until recently. Literally, this term means "water bag." It is quite possible, although conclusive evidence is lacking, that this term was formerly applied to the vessel here referred to as "canteen" (fig. 2, g, g′). The shape of this vessel is suggestive of a water bag.

Hill, following the Franciscan Fathers, states that canteens or water bottles are called *tqosa*. He gives in addition a fourth word, *tosíl*. These two terms seem not to be used in the Ramah area (1937, p. 10).

[3] "Cups bore the same name and accomplished the same purpose as ladles." Hill, 1937, p. 10.

[4] Formerly wooden cups were in use (7, 16, 32). Informant 15 stated that she knew of but one woman who had ever made a pitcher, and that this was used for milking. She had never heard of anyone who had made pottery cups.

[5] Hill, 1937, pp. 9–10.

[6] Seeds were parched in basketry trays (32, 192). It is possible, however, that the vessel referred to by 192 as *ʔása·ʔ ƛ̓ahí*, "pan", is similar to the form described by Hill. This vessel, which served formerly as a "frying pan', is said to have been unpainted and to have been "baked with gum."

[7] Sapir has shown by means of a comparative study of Athabascan languages how the word *ʔade·ʔ* may have undergone a series of changes in meaning coincident upon the southward migrations of the ancestral Southern Athabascans. He postulates that originally this word may have referred to a horn spoon, whereas now it designates a gourd or a dipper in the abstract (1936, pp. 225–227).

It is interesting to note in passing that certain evidence suggests that the generic word for "pottery" in Navaho is *ʔása·ʔ*. This fact is indicated in several ways. First, both of the interpreters employed during the course of this study, when they had occasion to mention "pottery" to an informant, translated this word as *ʔása·ʔ*. Both men, however, were well aware of the existence of the other Navaho wares. Similarly, when informants had occasion to refer to some nonspecific aspect of pottery manufacture, the word "pottery" was invariably rendered *ʔása·ʔ*. The term for "pottery clay," for example, is *ʔása·ʔ alʔį* (15, 32, 36, 192). Moreover, the word *ʔása·ʔ* occurs in terms which in fact do not apply to the cooking ware. The word for "paint brush" is given *ʔása·ʔ bilátahí*, although the cooking ware is said never to have been painted (15, 32, 192). Again, "I slip the pot" is rendered *ʔása·ʔ yišλé·ž* in spite of the fact that cooking vessels are never slipped (15, 32, 192). Finally, the word *ʔása·ʔ* seems to be the only term in the vocabulary applying to pottery manufacture which both interpreters and informants were unable to reduce to meaningful component elements. The term *łe·ċa·ʔ*, "bowl", may be reduced to "earth basket" (12, 32, 192).[8] Similarly, *tósǯe·h* means literally "water-gum", and is regularly applied to the pitch-covered basket (12, 32, 192).[9] The evidence seems to indicate, therefore, that, whereas the word which designates "pottery" in the abstract is *ʔása·ʔ*, the Ramah Navaho recognize that other words applying to pottery and its manufacture are "made-over" terms, and that they are able to break these down into the meaningful component elements of which they are composed.

Shapes and Domestic Usage

Cooking Vessels. Of the range of shapes manufactured in the unpainted style, the "cooking pot" seems to have been most common. This type of vessel is in general characterized by a pointed or rounded bottom; globular body, the neck of which is but slightly constricted; filleted, punctated, or incised decoration on the exterior of the neck; and a slightly everted rim (fig. 1, a, d, e). While this brief description represents, perhaps, the central tendency in cooking vessel shapes, variations seem to have been common (fig. 1, f, g, i). After they were fired, the cooking vessels received a generous coating of piñon gum, both inside and out. In size, as pointed out by Hill, the cooking pots range from three inches in height and two inches in diameter to three feet in height and two in diameter.[10]

When a vessel of this type was employed for the purpose of cooking, it was placed either in a mound of loose earth or in a shallow hole dug into the ground; due to the rounded or pointed bottom, the vessel did not stand upright of its own accord. Live coals were then heaped about the base (15, 32, 192). In order to facilitate handling, buckskin thongs or cords of wool were tied about the necks of these pots below the filleted band, since cooking vessels were not ordinarily equipped with lugs or handles (32, 192). Meat, milk, corn, and mush made from corn or wild seeds were boiled in these pots (15, 32, 36, 192). After the food had been cooked, it was transferred to the bowls and plates (7, 32, 192).[11]

The vessel called "large pot" (fig. 1, a), while used for cooking, seems more frequently to have been employed in the manufacture of dyes. According to informants 7 and 192, the roots of mountain mahogany were boiled in this type of vessel during the preparation of dyes for buckskins. Informant 32 stated that she formerly employed a vessel of this type when she prepared blue wool dye.

A variant of the "cooking pot" is the vessel called "wide pot" (fig. 1, g–i). This type is similar to the former except that it is shorter and has a wider mouth. In like manner it is unpainted, decorated with fillets around the rim, and is coated with piñon gum (pl. IX, i). According to 192, two black lines might be painted around the rim on the inside; these were broken at one point to indicate the "doorway." These vessels range in height from four inches to three feet, and were employed chiefly for cooking (32, 192). In the opinion of informant 32, the "wide pot" was frequently used as a milking receptacle, while 192 stated that she formerly used this vessel in washing her clothes and wool.

According to informant 32, water was occasionally stored inside the hogan in gummed and

---

[8] This fact has been pointed out previously by the Franciscan Fathers, 1910, p. 287.

[9] Today this term is customarily applied to wooden kegs in which water is stored.

[10] Hill, 1937, p. 9.

[11] The Franciscans state that the unpainted vessels were used for cooking purposes and in the preparation and boiling of dyes and medicines (1910, p. 288).

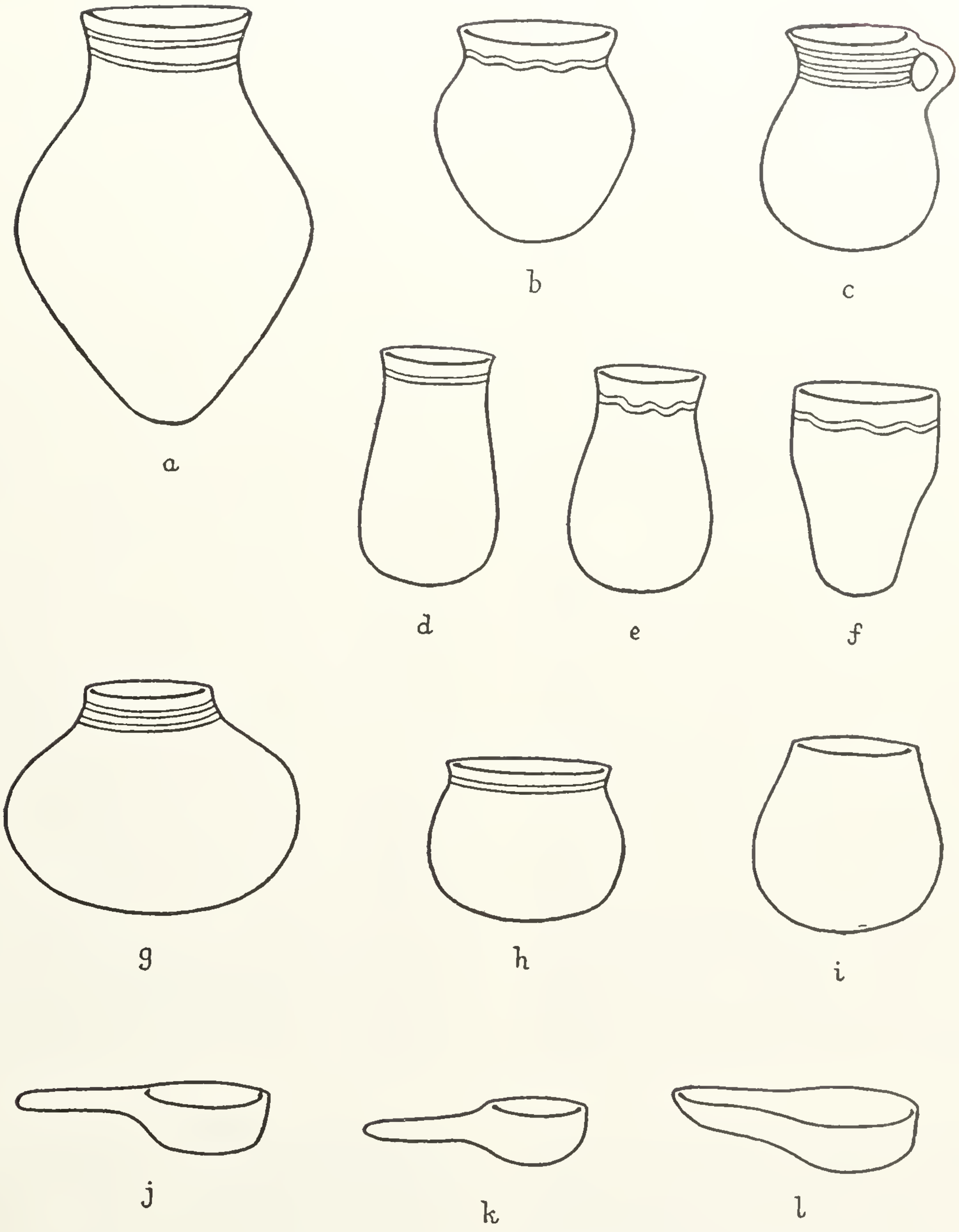

FIG. 1. NAVAHO COOKING VESSEL (a–i) AND LADLE (j–l) SHAPES.

a. "Big pot." Informant 192.
b. "Cooking pot, water gummed." Informant 36.
c. Pitcher. After Douglas, 1937.
d. Cooking pot. After Hill, 1937.
e. "Cooking pot." Informant 32.
f. "Little cooking pot." Informant 36.
g. "Wide pot." Informant 32.
h. "Wide pot." Informant 192.
i. Wide pot. After Hill, 1937.
j. "Black dipper." Informant 192.
k. Dipper. After Hill, 1937.
l. "Mud dipper." Informant 192.

unpainted vessels called *ʔása·ʔ tósže·h* (fig. 1, b).[12] These vessels were described as being almost one and one-half feet high, and "round in the middle." They either were decorated around the rim with raised patterns or lacked adornment. Presumably this type of vessel was similar to, if not identical with, the "wide pot."[13]

PAINTED VESSELS. With the possible exception of ladles, which seem to have been made in either style, the range of shapes represented in the painted style is distinct from that characteristic of the cooking ware. In the Ramah area, three forms of painted vessels were manufactured: (1) bowls; (2) water bottles; (3) canteens. Aside from shape, these vessels differ from the cooking pots in that they are slipped and/or painted, and in that they lack filleted rim decoration. In addition the painted pots are differentiated from the cooking pots in function.

In respect to the painted style, most of the older informants agreed that the vessels were customarily painted before firing (14, 15, 32, 192). Several women, however, admitted that they had seen some pottery painted after the firing (15, 36). According to one informant, the latter method was the better of the two. "I think this way is the best because the designs are sometimes spoiled if you paint them before you bake the pots" (36).[14]

Bowls. The most common form of painted vessel according to all informants is the bowl (14, 15, 32, 36, 192). In the opinion of 32, these range in diameter from three inches to two feet (fig. 3 a–k). The height varies from shallow plates to rather deep basins (32, 192). Bowls seem always to have been slipped and/or painted: "bowls were always painted (slipped), but some did not have designs on them" (32).

Most of the informants were of the opinion that food was not cooked in painted vessels, but that the bowls were used rather as food dishes (15, 32, 36, 192).[15] Informant 32 stated in addition that bowls were used as receptacles for boiling the inner bark of sumac when dyeing it for basketry. Again, they were used for washing and dyeing wool and clothes, and also for the purpose of non-ritual hair washing (15, 32, 192).[16] Informant 29 stated that when she was a girl, a deep bowl was used as a milking container. She also maintained that the milk was boiled in this vessel.

Water Containers. Two types of water containers—the "water bottle" and the "canteen"—seem to have been manufactured in the Ramah area. Due to a confusion of the linguistic terms applied to these vessels, and to the fact that but a single example was collected in the Ramah region, descriptions of these containers must of necessity be somewhat vague. In regard to this class of vessel, the literature is extremely sketchy, and Hill seems to rely mainly on the brief descriptions furnished by the Franciscan Fathers.[17] The account presented below is an attempt to match the descriptions given by informants with actual specimens in museum collections.

The "water bottle" (fig. 2, f, h) has a globular body, a somewhat contracted neck, and two vertically arranged strap handles placed on the walls of the vessel at right angles to one another (15, 32, 192).[18] In the opinion of these three women, the pottery water bottle was shaped essentially like its basketry counterpart.[19] Although the specimens of this type in museum collections bear painted decoration (pls. IX, a; XI, d, d′; XIV, a, c), informants stated that these vessels were slipped red or yellow, but were not painted (15, 32, 192).

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[12] Hill mentions the practice of transporting and storing water in cooking vessels (1937, p. 9).

[13] Pottery vessels were not used for the storage of any other materials than liquids (32, 192). Hill, however, mentions the practice of storing seeds in pottery vessels (1938, p. 28).

[14] The Franciscan Fathers state: "After baking, the pottery (excepting cooking utensils) was decorated with colored figures, the color being applied with a brush of yucca fiber, and prepared from black, red, yellow, and white clays or earths, mixed with water. This, however, has long since been discontinued as too tedious" (1910, p. 289). The latter portion of this statement suggests that the Franciscans' account is not based on observational data. Gifford's eastern informant stated that vessels were painted black and red before firing. According to Hill, pottery was slipped and painted before firing (1937, pp. 17–18).

[15] An analysis of the word for "bowl"—literally "earth basket"—bears out the statements of informants in this regard. Formerly baskets served as food containers, and still, until very recently, functioned in this capacity at weddings (7, 32, 192).

Hill states that bowls were never cooked in, but were used for serving food and as medicine containers (1937, p. 9).

[16] In ceremonials, the patient's hair must be washed with yucca root suds in a basket. See Franciscan Fathers, 1910, pp. 340, 417–418; Reichard, 1928, pp. 137–138.

[17] Franciscan Fathers, 1910, pp. 285–286. Hill, 1937, pp. 7, 10.

[18] The Franciscan Fathers state: "The early water pots were shaped much like the wicker bottle, with two loops or eyelets on the sides, and were similarly carried on the back." A second description is given (see fig. 2, c) which is unlike the first, and which does not seem to fit any Navaho vessel seen by the writer. "The water bottle was provided with a loop, or finger handle, near the neck, so that it might be conveniently grasped in pouring out its contents. They were shaped much like an ordinary

The term "canteen" is here applied to that type of water bottle which is flattened on one side to facilitate carrying (fig. 2, g, g′).[20] There is some evidence to indicate that vessels of this type had but a limited distribution among the Navaho. Canteens of this shape seem not to be represented in museum collections, although water bottles are frequently encountered. Perhaps the presence of this form in the Ramah area is to be explained by the fact that similar canteens were formerly manufactured at Zuñi.[21] The specimen collected in the Ramah area (pl. IX, e, e′) was found by informant 192 near her hogan, in a cave, associated with a painted vessel undoubtedly attributable to Navaho manufacture. Informants 15 and 192 were familiar with the canteen form and claimed that they were formerly manufactured by Navaho potters. While they stated that these canteens were slipped yellow or red, both denied that they were ever painted.

Informants 15 and 192 were of the opinion that canteens and pottery water bottles were formerly used both in transporting water and in storing it in the hogan.[22] Informants 32 and 36 stated that water was not usually transported in pottery vessels; for this purpose the pitch-covered basket was employed. Water was, however, stored in a pottery water bottle or even in a large bowl (32, 36).

Lids were not manufactured for the water containers. The bottles and canteens were stopped up with grass, oak leaves, or a corncob (15, 32, 192).

Aberrant Forms. Whereas Navaho pottery may be divided into two basic styles on the basis of shape, decoration, and function, certain isolated examples—although quantitatively these are few in number—furnish exceptions to such a division. A small painted vessel (pl. IX, b) collected in the Ramah area possesses a typical cooking ware shape, but is slipped and painted. That this vessel was atypical was recognized by informant 192. "In the old days pots shaped like this were not painted; they had beads around the rim." A specimen in the Heye Museum collection (pl. XI, b) possesses a typical painted pot shape, filleted decoration, and is in addition painted. Several pitchers of the type illustrated in fig. 1, c, were noted in various collections. It is indeed possible that these vessels were manufactured in sufficient numbers to warrant the inclusion of this shape among the typical cooking pot forms. A miniature water bottle was noted in the Peabody Museum collection which was manufactured in the cooking pot style, and then coated heavily with piñon gum. Other non-typical forms are illustrated in pl. XII, b, and pl. XIII, d, f.

In this connection, it may be noted that informant 192 formerly manufactured several corrugated pots, *nánesci·ʔí*. That this practice was unusual is indicated by the fact that other informants denied that Navaho women ever made corrugated pottery (14, 15, 32).[23]

Dippers and Ladles. These vessels (fig. 1, j–l) seem to have been manufactured in either the cooking or painted styles.[24] According to in-

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pitcher omitting the spout and handle, and with a narrower neck than that of the water pot" (1910, p. 286). It is not impossible that some vessels which in this paper have been classed as pitchers (fig. 2, d), but which lack a true spout, may be equated with this description.

[19] "You make a water bottle out of clay when there is no sumac around" (192). "Sometimes the right plants for baskets don't grow around near; then you have to make a water bottle out of clay" (15).

[20] This lateral flattening is mentioned by the Franciscan Fathers, 1910, p. 286..

[21] See Stevenson, 1883, fig. 386.

[22] "The water bottle keeps the water cold on hot days. You should always make two water bottles at the same time, because if you have only one, it will pull the horse's saddle sideways" (15).

[23] Informant 192 manufactured this ware by adding small strips of paste spirally to a completed cooking vessel. The lower edge of each strip was indented with the end of the right index finger. She made only one or two vessels of this type, and added the corrugations simply as decoration. "I didn't learn how to make these from the woman who taught me how to make pottery. I learned from another Navaho woman who was making this kind of pot. I don't remember her name—I didn't call her anything; I only saw her one or twice. This was when I lived down around Quemado—before I went to Fort Sumner. When I came back from Fort Sumner and started to make pottery, I made a few pots like this. I only made one or two."

Hill states that the grandmother of one of his informants made cups after the form of those discovered in the ruins (1937, p. 10). These cases, as well as the presence of aberrant vessel shapes, serve to indicate experimentation on the part of some Navaho potters.

[24] The diameters of dippers range from two to four inches and their lengths from six to eight inches. Hill, 1937, p. 10.

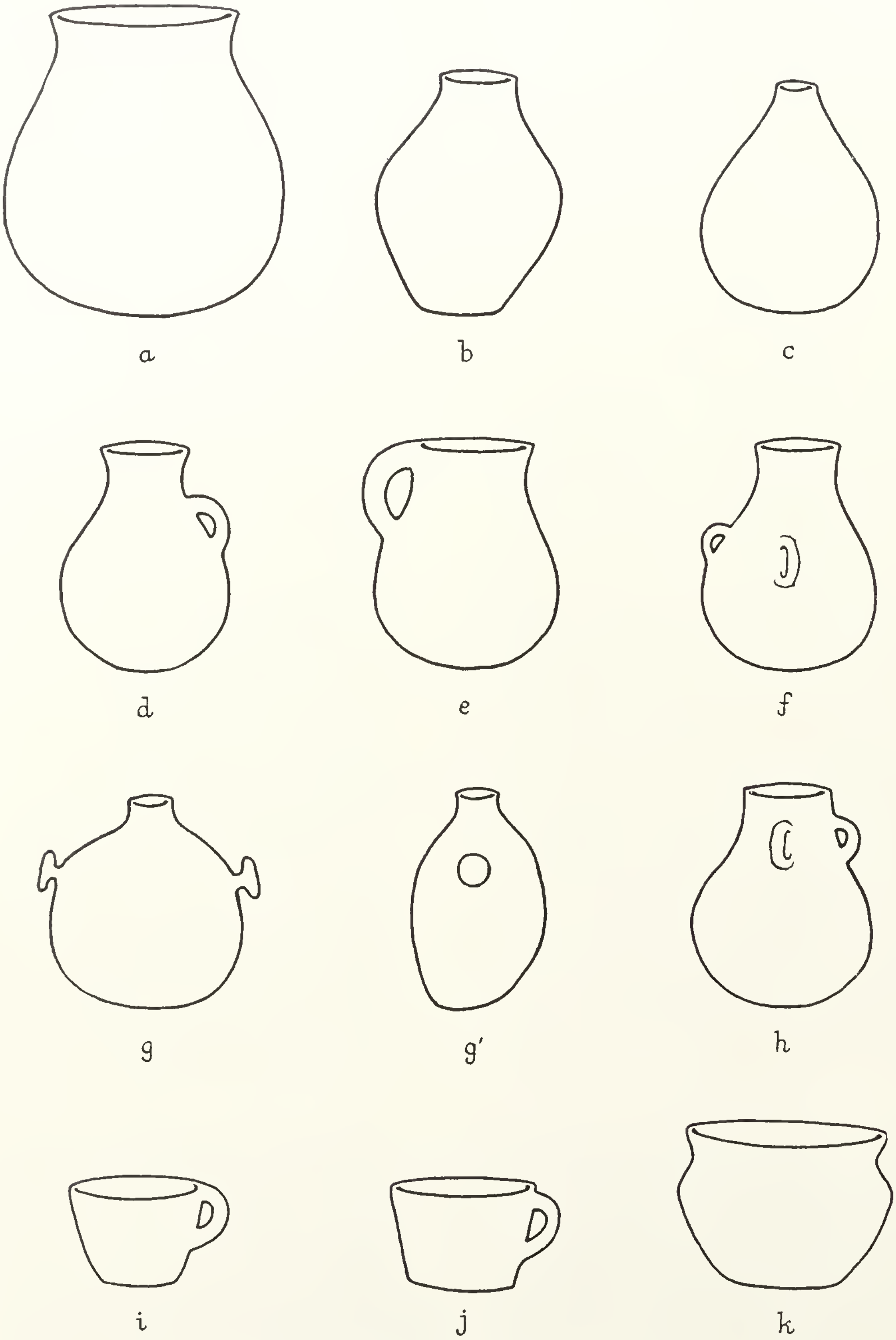

FIG. 2. NAVAHO PAINTED VESSEL SHAPES.

a. Water storage jar. American Museum of Natural History.
b. Water bottle. William Evans collection, Shiprock, New Mexico.
c. Water bottle. Franciscan Fathers, 1910.
d. Pitcher. American Museum of Natural History.
e. Pitcher. Museum of Anthropology, University of California.
f. Water bottle. Museum of Anthropology, University of California.
g, g′. "Canteen." Purchased from informant 192, now in Peabody Museum, Harvard University.
h. Water bottle. Denver Art Museum.
i. Cup. Denver Art Museum.
j. Cup. L. T. MacKinney collection.
k. Olla. L. T. MacKinney collection.

formants 15 and 192, dippers were modeled all in one piece; the handles were not made separately.[25] Two principal shapes were manufactured: (1) a bowl-shaped form with an elongated handle (fig. 1, j); (2) a type which resembles a half of a gourd cut lengthwise (fig. 1, l; pl. XV, j). The former type, called *ʔade·ʔ žiní* ("black spoon"), was unpainted and was coated after firing with piñon gum (7, 32, 192). This form was employed in serving food, but not for drinking (7, 32, 192). The second type, *hašƛ̓iš ʔade·ʔ* ("earth gourd"), served as a cup for drinking soup, water, or boiled milk (7, 192). A difference of opinion existed as to how these vessels were decorated. According to 192, they were "baked with gum," whereas 32 stated that they were slipped red or yellow, but were not painted with designs.[26] Only this latter type of dipper seems to have had perforated handles for suspension (192).

Figurines. Crude effigies, *hašƛ̓iš da·nę́ʔę́*, "mud playthings," were manufactured formerly. These represented animals (horses, sheep, and goats), men and women, and miniature cups and dishes (15, 36, 192).[27] These were made by the women for their children to play with; according to informant 15, these toys were often modeled by the children themselves. A few incised lines served to indicate the facial features, although the figurines were never painted. These toys were either fired (15, 36) or were left in an unfired condition (192).

Crucibles. The Franciscan Fathers state that crucibles were manufactured by the silversmiths, and that they were, in effect, "cooking pots in miniature." They point out, however, that few if any are made today, since strong and durable crucibles can be obtained at the trading posts.[28] Matthews states: "Crucibles are made by the more careful smiths of clay, baked hard, and they are nearly the same shape as those used by our metallurgists, having three-cornered edges and rounded bottoms. They are usually about two inches in every dimension."[29] Informant 12, himself a silversmith, agreed that crucibles, *hašƛ̓iš bi·ʔidilyį́hį́*, were occasionally made by women (never by men), but that the majority of them were purchased from the Zuñi. On the other hand, 32 had never heard of the manufacture of crucibles by Navaho potters. According to 192, crucibles were formerly manufactured either by men or women. In height these vessels ranged from three to three and one-half inches. The shapes varied from the three-cornered type described by Matthews to simple bowl-shaped vessels with flat bottoms and slightly flaring walls.

Ceremonial Usage

Stevenson has written of Navaho earthenware vessels which held water during ceremonials, and of "a small earthenware vase containing water and finely chopped herbs," the medicine.[30] Similarly, informant 32 related: "In the old days, the singer used a painted bowl to mix the medicine in."[31]

The degree of importance attached to the employment of Navaho-made vessels in song ceremonials varies from one individual to the next. Informant 3, an aged singer, stated: "In all sings you must use a pot to cook meat for the patient. Just as long as it is made out of clay, it does not make any difference whether it is made like a

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[25] Hill states that this type of dipper was characteristic of the central and eastern areas. The method of firing was identical with that used in the case of painted bowls. These dippers were occasionally painted and some bore holes in the handles for suspension. In the west, the dipper was fashioned into a bowl, one end of which was squeezed together to form the handle. Fillets of paste were then added around the bowl to give it depth and to the top of the handle to strengthen it (1937, p. 20). The Franciscans state: "Earthen spoons and dippers were in shape like the gourd ladle, and were, like it, used for the purpose of dipping out liquids" (1910, p. 286).

[26] Informant 192 referred to these dippers as *łe·c̓a·ʔ žiní* "black bowl."

[27] Hill states that dolls and animal figures were made of clay. These were generally sun-dried and then given to the children for toys (1937, p. 10). Gifford's western informant stated that effigy figures, principally birds, were manufactured. His eastern informant stated that figurines were not made. Fewkes reports this practice from among the reservation Navaho. The effigies, he states, were unfired. The majority of human figurines depicted women, the facial features usually not being represented. When the figure is depicted as wearing a blanket, the extremities are also absent (1923, pp. 559–562). Mr. Richard Van Valkenburgh has informed the writer that the Navaho of the Little Colorado River region also make figurines representing such subjects as buffalo, mountain sheep, horses, antelope and deer.

[28] Franciscan Fathers, 1910, pp. 274, 287.

[29] Matthews, 1883, p. 173.

[30] Stevenson, 1891, pp. 244–245.

[31] Hill mentions the use of painted Navaho bowls as medicine containers in ceremonials (1937, p. 9).

The Franciscans state: "The earthen pot is also required in the preparation of medicines productive of emesis in the course of some ceremonies." Franciscan Fathers, 1910, p. 289.

Navaho pot or not."[32] He added further that any vessel might be used to cook meat for the visitors. According to 192, any kind of a small pottery vessel could be used to hold medicine for a sing. That this general attitude is borne out in practice is indicated by several bits of evidence. In one curing ceremonial, the medicine was administered to the patient in a Laguna polychrome bowl.[33] Again, when 7 had an Enemy Way a few years ago, he obtained an unbaked vessel from Zuñi which was subsequently fired by 14.

On the other hand, informant 1 asserted that the deer meat boiled for the patient in a Female Shooting Chant must always be cooked in a Navaho cooking pot. Similarly, informant 15 maintained that a Navaho cooking pot must be used in preparing the meat for Chiricahua Apache Wind Way and Night Way.

A detailed account here of the preparation of the drum, *ʔása·ʔ dádíƛó·hí*, and the drumstick, *ʔása·ʔ be· ʔiltąží*, for use in song ceremonials would be unnecessary, since this subject has been covered adequately elsewhere.[34] Several details, however, may be added. A Navaho cooking pot, which may be converted into a drum by the addition of a little water and a wet buckskin to serve as a head, is required for every Enemy Way ceremonial (7, 12, 15, 32). Since no one in the Ramah area now makes these vessels, all are heirloom pieces. According to 3, "if you know the people well, they will loan the drum to you; otherwise, you must pay them a little." Informant 7 possessed a drum which he kept in a sack hanging in a piñon tree some twenty-five feet southeast of his hogan. He stated that a drum should not be kept in the house. Similarly 15 stated: "As soon as you finish making a pot to be used as a drum, you hang it outside in a tree. You can store it in an empty hogan, but not in one where people are living."

After a cooking pot has once been employed as a drum, it may never again be used for cooking purposes (15, 32, 192).[35] Informant 1 stated: "You cannot just use any pot for Enemy Way. The potter makes the pot the same way, but after it is finished, it is hung up inside the hogan, and everyone around is told that it is to be used in Enemy Way, and that no one is to cook in it. The man that is to use it takes it to where the sing will be, and the singer sings a song for the pot and another for the stick; but not all Enemy Way singers know these songs."

Every two years or so the drum must be coated again with more piñon gum; otherwise, "it does not make much noise . . . but if you make it new again, it makes a lot of noise" (36).

Care and Treatment of Vessels

Formerly, when a vessel became cracked, it was mended in the following manner: a hole was bored on each side of the break; then the crack was sewed together with strips of sumac and plastered over with mud (32, 192).[36]

When, however, a vessel became broken beyond repair, the pieces were gathered up, taken out, and placed under a rock or in some dry place out of the rain (15, 32, 36, 192). If only a large fragment was broken from the rim, the vessel was taken some distance from the hogan and hung up in a tree by a string (32). "It is just like a human burial. The pot has been good during its life and must receive good treatment" (15). Mr. R. F. Van Valkenburgh pointed out to the writer certain hogan sites of some apparent age in the vicinity of Fort Defiance, New Mexico. Numerous sherds of both painted and cooking vessels were found on the surfaces of the ash dumps which seem usually to be located a few yards east of the doorway.

A difference of opinion existed among informants as to what was done with a pottery vessel in event of the death of the owner. According to 15, "If a person who owns a pot dies, take the pot away from the hogan and put it in a safe place, or just hang it up in the hogan and leave it . . . do not break it. Do not put the pot with the dead person."[37] Similarly, 192 stated that pottery was not disposed of with the dead. "If a person dies in the hogan, the poeple have to leave it and take the pots and baskets along with them." In the opinion of 32, however, the vessels might be placed with the corpse. "In the old days, when a woman died who owned several pots, the pots were broken and either buried with her or left in the hogan."[38]

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[32] For curing ceremonials, the family of the patient bought a pot from a potter, and it would be later given to the singer as a part of his fee (3).

[33] Mr. Richard Van Valkenburgh has written me that he has seen Hopi bowls in use as liquid containers for medicine in the Fort Defiance region.

[34] Father Berard Haile, 1938, pp. 43–44; 263–265. Franciscan Fathers, 1910, p. 289.

[35] "A pot that has been used for cooking can't be used as a drum. A drum must be specially made. After a pot has been used for a drum, you can't eat out of it again or you will get sick in Enemy Way" (192). Hill states that any pot may be used as a drum, but that after it had been employed in this manner, it could never be used again as a cooking vessel (1937, p. 9).

[36] Dyk relates the following method of mending a pot in his recording of a Navaho autobiography (*Son of Old Man Hat*): "She put something in the hole to stop it up and then went out and got some gum of the piñon tree. She put the pot in the fire, and when it was hot she put the gum all over it. She renewed the pot" (1938, p. 64).

PARAPHERNALIA

Primary Paraphernalia

Scrapers. But two types of scrapers seem to be employed by the Ramah Navaho potters. The first consists of a piece of corncob, *dáʔáci·n*, about three inches in length, the exterior of which is first singed in the fire to prevent it from too severely abrading the surface of the vessel (15, 32, 192). Small pieces of gourd, more commonly used for polishing the vessels, may be employed also as scraping tools. Since gourds are not ordinarily grown by the Ramah Navaho, they are obtained by trade from the Zuñi, Laguna, or Hopi pueblos (15, 192). The former informant stated that she had obtained gourds for this purpose from Zuñi or Laguna, and usually gave calico or a saddle blanket in trade.

The existence of potsherd scrapers was denied by informants 15, 32, and 192. Informant 32 stated that smooth scrapers of wood were formerly employed, but the use of these was denied by 15 and 192.

Polishing Tools. Polishing stones, *céʔáwózí*, are smooth, water-worn pebbles which vary in size from one and one-half to three inches, and in shape from roughly spheroid to elliptical. They are employed in surfacing the vessels after the construction has been completed, and again after the slip has been applied (14, 32, 192).

The stones employed by informant 32 were obtained by her son from a gravel deposit some distance away from her hogan. Another potter (14) used river gravel pebbles which she obtained from the debris tossed up during the drilling of a well near her home.

Informant 15 stated that she never used polishing stones, but instead employed a gourd smoother *ʔade·ʔ beʔadi·lkǫhí*, for this purpose; 192 considered the gourd smoother as an alternative for the polishing stone.

It was specifically stated that polishing stones are never collected among the neighboring Pueblo ruins (32, 192): "You just pick them up anywhere. There are too many around to go to ruins for them. Besides, many women are afraid that they will get sick from those places" (192).

The latter woman asserted that the same polishing stones may be used again and again, and that they are stored in a sack in the hogan. Although she stated that the polishing stones may be inherited by a woman's daughters, the other informants agreed that this is not ordinarily done.

Paint Brushes. The brush, *ʔása·ʔ be· bikináʔatzohí*, consists of a narrow sliver cut from a leaf of *Yucca baccata*. Brushes range from three to three and one-half inches in length, and average a quarter of an inch in width. The end of each strip is sharpened to a point along a single edge by means of a pocket knife. According to informant 32, paint brushes must always be made of this material, "or the paint will not stick on." The sharpened ends of the brushes are not chewed in order to separate the fibers, and because of this, the brush must be manipulated as though it were a pencil (32, 36, 192).

A separate brush is made for the application of each color. These brushes are manufactured fresh each time they are required, and are thrown away after the painting has been completed.

Incising Tools. At the present time, the incised decoration which encircles the neck of the cooking pot is made with the aid of a burned match stick (15, 32). Formerly, however, a small piece of yucca leaf, called *ʔása·ʔ be· baʔadaʔaci·*, was employed for this purpose (15, 32, 192). Sometimes the incising was done with the nail of the right index finger (15, 32, 192).

Gumming Brush. A specially prepared brush is used to apply piñon gum to the cooking vessels after they have been fired (15, 32, 192). Informant 32 prepared one by cutting a bough about a foot and a half long from a piñon tree near the spot where the firing took place. Taking up a yucca leaf, she tore it into thin strips, using her knife to aid her in starting the tears. She then tied these yucca strips together to form a longer piece, and with this she bound the needles of the bough together to form a crude brush. The brush is called *ǯe·h be·ldéisi.*

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[37] Dr. L. C. Wyman informs me that he has seen a painted Navaho vessel abandoned in a hogan in which a death had occurred.

[38] Dr. A. V. Kidder informs me that he has never heard of a vessel of Navaho manufacture being found in a Navaho grave. Mr. Richard Van Valkenburgh has written me that, in so far as he has been able to determine, pottery vessels are not placed with the dead; in the Fort Defiance, Chinlee and Little Colorado River regions, however, the pots are "killed."

SECONDARY PARAPHERNALIA

DIGGING TOOLS. At present the clay is dug with a shovel, or, as in the case of informant 15, with the spoon of a broken shovel. Formerly, however, a digging stick, *giš*, is said to have been used for this purpose (15, 32, 192). This implement was made preferably of some hard wood, sharpened at one end to a flat, sharp point. Presumably this implement was similar to or identical with one of the two types of dibbles formerly used by the Navaho in planting.[39]

CARRYING AND STORAGE RECEPTACLES. The clay is transported from the deposits to the potter's hogan by means of a large sack, usually of burlap. Provided that the distance is not too great, this may be carried on the back. Otherwise the sack of clay is packed on horseback. Formerly the clay was transported in a blanket, or a piece of a blanket, by means of a tump-line, *biƛ̓o·l*, (15, 32).

The clays and paint pigments are stored in sacks of various sizes, or are wrapped in cloths and tied into small packages. These bundles are then usually placed in large burlap sacks, which are then tied to one of the roof beams of the hogan (15, 32, 192). Occasionally the packages of pigment may be stored in a trunk or in a padlocked wooden box, one of which is usually present for the safeguarding of valuables (32).

GRINDING SURFACES. The clay may be ground on the family metate (pl. I, a), or on some similar makeshift device. One potter employed for this purpose the metate and mano customarily used in grinding corn (15). The grinding surface of this metate was roughly oval and slightly concave along the long axis. It measured forty-one centimeters in length and twenty-five in width, some six centimeters thick in back, although somewhat thinner in front. The mano was roughly rectangular, measuring twenty-six centimeters in length, ten in width, and five in thickness.

A similar metate was employed by informant 32 in grinding the clay, while 14 used an unprepared slab of sandstone for this purpose, as well as a smaller block of this material for a mano. A similar, but smaller, makeshift device was used by 32 to grind the paints.

WATER CONTAINERS. While working on the vessels, the potter keeps beside her a lard pail partially filled with water (pl. III, b). Into this she dips the corncob scraper to remove the clay which it has collected while scraping the vessel walls. From time to time she sprinkles water over the paste to prevent it from drying too rapidly, and now and then she dips her hands into the pail to clean them (15, 32).

PAINT RECEPTACLES. The paints and slips are mixed, in concave sections of yucca leaf, *cáʔászi be· λe·š tadokaxli·* (pl. IV, a). These leaf sections range from three and one-half to five inches long, and are made by cutting the stout outer leaves of *Yucca baccata* into lengths with a pocket knife. Since the paint is never stored in a mixed condition, these containers are discarded as soon as the painting has been finished (32, 192).

WIPING RAGS. During the construction of the vessels, as well as during the painting, the potter keeps a cloth spread out in her lap to prevent her clothes from becoming soiled (pl. III, b). Other rags are kept at her side to be used now and then to wipe the clay and paint from her hands (15, 32).

ACCESSORIES IN FIRING. When the vessels are ready to be fired, various items must be collected for this purpose. A stout stick is picked up near the hogan to be used as a poker in spreading out the embers of the preliminary fire. Then several stones averaging about eight inches in diameter are collected and arranged in the circle of glowing coals to serve as supports for the vessels during the firing (pl. VI, a). Upon these the vessels are placed directly, since no grate or grill is employed. No props are used to prevent the fuel from coming into contact with the vessels during the burning (32, 192).

After the firing has been completed, a shovel is used to rake the ashes away from the red hot vessels. The pots are then removed from the coal, by means of a long stick of fire wood (32, 36, 192).

POST-FIRING ACCESSORIES. After the vessels have been fired, a nest of green weeds is made to support the red hot cooking pots while the piñon gum is applied (pl. VII, c, d). Several handfuls of rabbit brush, *k̓í·łsoi*, are gathered and arranged in a thick layer on the ground near the remains of the oven (32). The cooking vessels are then placed on this nest by means of a short stick of green piñon wood (pl. VII, b). This stick is used later to facilitate the handling of the hot vessels (15, 32, 192).

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[39] Franciscan Fathers, 1910, p. 265. Hill, 1938, p. 32.

THE COLLECTION AND PREPARATION OF RAW MATERIALS

Ingredients

Clay. *Clay deposits.* The clay best suited for pottery making is called *ʔása·ʔlaʔį́*, "pottery clay" (15, 32, 192).[40] This particular variety, however, seems to be lacking in the Ramah region proper except in certain areas on or adjacent to the Zuñi reservation. While informant 32 stated that she used to gather this clay on the top of a hill behind her hogan (which is on the southeastern edge of the Zuñi reservation), she assured the writer that this deposit had long since been exhausted. The fact that suitable pottery clay no longer exists in the area proper was also corroborated by the statements of other informants (14 and 15). Informant 32 asserted that: "in the old days, people used to buy the clay from the Zuñi potters and bring it to me to be made up into pots for them." It seems probable that as long as pottery making continued to be engaged in by the Ramah Navaho potters, some of the clay was obtained through trade from this source.[41] In the case of the pots observed during their manufacture, the writer secured the clay for informants 32 and 14 at Zuñi.

According to Mrs. Stevenson, the clay used by Zuñi women in the manufacture of pottery was obtained on Corn Mountain, as well as near the farming districts of Ojo Caliente and Pescado.[42] This material, which, as stated above, is preferred by the Ramah Navaho potters, is a hard, laminated, grayish-black clay which must be pounded with a rock to reduce it to small pieces before it can be ground to a finer state on the metate.

Gathering the clay. When it was suggested to informant 15 that she make some pottery, she remarked that it had been so long since she had last made any, that she no longer remembered where to find the proper clay. She agreed, however, to look around, and finally succeeded in locating a clay deposit on a little hill about a half a mile southwest of her hogan.

The deposit was stratified on the sloping side of a little mesa, just below outcroppings of weathered sandstone and shale. From these the clay had washed down in a fan-like formation. Taking up the spoon of an old shovel which she had brought along with her, the potter dug a test hole in the middle of the deposit. Then, sitting down beside the hole, she modeled a little bowl from a handful of the clay in order to test its properties and consistency. After experimenting for a few minutes, she remarked, "This is not the right kind of clay; the right kind has more orange in it. I am not sure that it will work, but I think that it might be all right."

The surface of the deposit was wet and plastic from recent rains. She dug below this layer and collected small, dry particles and flakes, inspecting them carefully before depositing them in the burlap sack beside her.

She stated that there were three kinds of clay stratified in this deposit, but the writer found difficulty in distinguishing between them. The top stratum was composed of a soft, plastic, gray clay called *hašλ̓iš dičid*, "sticky mud", which she said was apt to split in the drying. As she dug beneath this layer, she mentioned that she used this mud in washing wool. Immediately below this layer was a second stratum containing a clay called *céλád*. This was a dry, flaky, dark gray substance, flecked with orange. The third stratum contained a greenish-gray clay, somewhat lighter in color than the *céλád*, and flecked with yellow. This kind is called *łe·co*, the same term which is applied to yellow ocher. She said that the best pottery clay, the *ʔása·ʔalʔį́*, "is dark gray, with more orange in it, and very sticky when wet." This description does not tally with the observations made on the Zuñi clay, which informant 32 designated by the same term.

Informant 15 gathered the particles of the *céλád* and the *łe·co*, and deposited them together in a sack. They were not sorted out later, but were ground together in preparing the paste. Each particle was thoroughly examined by breaking it open and carefully inspecting its color and consistency.

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[40] Informant 192 called this clay *hašλ̓iš dičid ʔása·ʔalʔį*.

[41] Informant 15 maintained that she never bought clay at Zuñi. When she was actively engaged in pottery making, she used to buy clay from her maternal grandmother who lived four miles west of Two Wells. "She always had it on hand. I used to pay her a goat for enough clay to make three pots."

[42] Stevenson, 1904, p. 374.

Preparation of the clay. As soon as informant 15 returned to her hogan with the clay, she set about to grind it.[43] This was done in an unoccupied hogan apart from the rest of the family, who are not supposed to watch pottery during the course of its construction. Spreading out a piece of canvas on the floor to the left of the door, she placed a metate, *cétašžíʔ*, and mano, *cétašžín*, in the center of it. The unground clay, in the sack in which it was collected, was placed on her right. Kneeling behind the metate, she elevated the near end by propping it up on a flat stone in order that the grinding surface might slope away from her (pl. I, a). She then removed a handful of clay particles from the burlap sack beside her and placed them on the metate. Then, taking up the mano in both hands, she pushed it over the grinding surface with a backward and forward motion. Now and then she paused to scrape away masses of clay which had stuck to the surface of the metate. After grinding all of the clay once, she remarked that it was not grinding well because it was damp. She therefore discontinued this operation until the clay had become thoroughly dry. After placing the piece of canvas outside in the sun, she spread the clay out on it and left it to dry for several hours.

When the clay had become quite dry, the grinding was resumed. The once ground clay was deposited in a pile on her left. Scopping this up from time to time with her left hand, she scattered it out over the grinding surface of the metate. The mano was kept in almost constant motion in her right hand, so that as little time as possible was lost. The ground clay was pushed off the far end of the metate where it collected in a pile.

If the clay is dry when gathered, it need only be ground twice. If, however, it is damp, it must be ground four times. The clay in its unground state is called *yikáhágí·*, "not ground yet", while the ground clay is called *ho·lkałígí·*, "ground." No matter how many times the clay is reground, the portion being reground is referred to as *yikáhágí·*, while the reground portion is called *ho·lkáłígí·* (15).

After the clay had been finely ground, it was again spread out on a cloth to dry in the sun. Informant 29 dried the ground clay inside her hogan by placing it in the circle of light which entered through the smoke-hole. Her two grand-daughters (37 and 38) worked through it, breaking up the larger pieces with their fingers, and exposing the clay underneath to the sun. Any impurities are picked out at this time by hand, because the clay is neither winnowed nor sifted (15, 32, 192).

Clay thus prepared is ready to be kneaded into paste or to be stored for future use. If it is to be stored, it is placed in a sack, tied with a length of cord, and suspended from one of the hogan roof beams. It is not placed on the floor if there is a possibility of the contents becoming damp. Clay is not stored specifically for winter usage (15, 32).

TEMPER. The reason for adding some tempering material is that the temper "makes the clay stouter and makes it stick together better" (15).[44] This potter suggested that it also prevented the paste from sticking to her hands as she kneaded it.

For tempering material the Ramah Navaho potters employ postsherds, *kį́či·ł*, which are collected in the vicinity of numerous Pueblo ruins that occur in the area (14, 15, 32, 192).[45] These places are greatly feared by many Navaho because of the spirits of the dead which are thought to linger about them.[46] The degree to which this view prevails varies from one individual to the next. Informant 32 claimed that anyone might go among the ruins to collect the potsherds, and that no ritual was necessary to ward off the evil influences. On the other hand, informant 15 stopped making pottery altogether because she believed, and was told so by a singer, that she had become sick because she handled these sherds.[47] When she made pottery for the writer, she refused to put any ground potsherds in the paste, and, as a consequence, the vessels split during the drying. According to informant 192, one should use potsherds for temper, but should not look for them in ruins.

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[43] Whereas informants 14 and 32 ground their clay in the manner described, 192 maintained that she never did this. "When you get the clay out of the ground, the clay doesn't have to be ground. You just mix it up and start."

[44] Using sand for temper was denied by 15, 32, 192.

[45] While this word is used to designate potsherd, it refers more specifically to the ruins among which the sherds occur. Interpreter 12 translated it as "house torn down." Informant 192 designated the potsherds as *kįči·ł le·ča·*, "ruin pottery." Mr. Richard Van Valkenburgh has informed the writer that Canyon de Chelly potters use Anasazi sherds for temper.

[46] Wyman and Kluckhohn, when speaking of disease acquired through infection by the spirits of the dead, state, "Almost any disease may result from any sort of contact with the dead or with their possessions" (1938, p. 15).

[47] The writer has pointed out elsewhere the role that this factor may have played in contributing to the decline of Navaho pottery manufacture. Tschopik, 1938, p. 261.

After the potsherds have been collected, they are finely ground on a metate (32, 192).[48] Informant 32 stated that they were not washed before the grinding. "You just grind them like you find them."

The proportion of temper to clay seems not to have been clearly fixed.[49] Informant 15 stated that she used to add a handful of ground sherds to enough clay to manufacture one medium sized cooking pot. Informant 14 added six medium sized corrugated sherds, secured from a nearby ruin, to sufficient clay to make up three small bowls.

There seems to be no preference as to painted or corrugated sherds for tempering material, and these are employed in the manufacture of vessels and pipes alike.

Because of the abundance of tempering material in the area, the potsherds seem never to have been stored.[50]

Preparing the Paste. After the clay and the potsherds have been ground separately, the potter is ready to prepare the paste, *hašƛ̓ištâosni·*, (15, 32, 192). This process may be divided into two phases: the mixing and the kneading. The former operation may precede the latter or be coincident with it, since the ground potsherds may be added to the clay either before (32) or after the water is stirred in (192). "The clay and water are mixed first. Then you add a handful of ground pottery. If this is not enough, you have to put in more. If you do it this way, you can see when you have enough of the ground pottery." In any case, the two materials are thoroughly mixed during the kneading.

As soon as informant 15 finished grinding the clay, she stepped outside for a minute and returned with a lard pail full of warm water and an old frying pan. Into the latter she dumped the ground clay and temper, pouring them from the piece of canvas on which they had collected during the grinding. Onto the canvas she placed the pan of clay, holding it by the rim with her left hand, while she poured a little water into it with her right. She kneaded the paste with both hands (pl. I, b), forcing them down into the clay which she squeezed with each hand separately. From time to time she poured in a little more water from the container beside her, using her right hand, while she continually kneaded the paste with her left. Then, doubling both fists, she repeatedly forced them down into the paste. Remarking that the paste was too stiff, she poured in more water.

From time to time she dipped her right hand into the pail of water at her side, not so much to clean it as to prevent the dry particles of clay from sticking to it. This also served to keep the paste in a moistened state.

Now and then she turned the mass of paste over and scooped up the dry particles of clay in the bottom of the pan, incorporating them into dough. After ten minutes, she had kneaded the paste into a rough ball about eight inches in diameter. This she turned over and over, working it around and about. Frequently she picked up the loaf and dropped it back again into the pan, slapped it with her palms, and kneaded it with her fingers.

Finally all of the particles of clay had been incorporated into the dough, and all of the water had been absorbed. The color of the clay had become considerably darker due to the addition of the water, and the consistency was that of putty, with the texture uniform throughout. If the surface of the lump of paste was pinched, a network of fine cracks appeared. The mixing process was considered complete when the particles of temper became visible in the paste (32).[51]

After sprinkling the dough with a little water to keep it moist, the potter covered it with a damp cloth to prevent it from drying out. The mixing and kneading occupied the potter's attentions for about twenty minutes.[52]

Paints and Slips. In considering the paints used by the Ramah Navaho in decorating pottery vessels, two materials must be taken into account: the pigment, and the medium in which the pigment is mixed. Of the pigments, five of mineral derivation seem to be employed. These colors are yellow, black, red, white, and blue. Of these, blue seems actually to be employed only in the case of the ritually prepared pipes. It also seems probable that white is used in the main only as a slip, although red and yellow, or a blend of these two colors, is also employed for this purpose. Black was used in decorating pipes and also for painting designs on pottery vessels.

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[48] Informants 14, 32, and 192 maintained that the clay and temper should be ground separately.

[49] According to informant 192, the proportion of temper added was not measured. "Just think about it."

[50] Statements to the effect that this was not done were made by informants 32 and 192.

[51] Informant 15 also employed this criterion. "You can tell when the clay is ready to use by the color" (192).

[52] It is not necessary to allow the paste to stand before it is ready to be used (15, 32, 192).

Medium for the pigment. Ordinarily the pigments are mixed with the juice of the broad-leaf yucca (*Yucca baccata*), *cáʔászi* (14, 15, 32, 192).[53] Since this plant occurs abundantly in many parts of the Ramah area, it is easily procured, and is usually gathered by one of the potter's children.[54] A plant is collected by cutting the stalk off close to the ground with a knife; the whole plant is brought back to the hogan, where it is stripped leaf by leaf. The tough outer leaves are discarded, since the smaller inner ones yield a greater quantity of juice. This juice acts both as a vehicle for the pigment and as a binder during the painting.[55] As informant 32 explained it, "it makes the paint stick on"; in the words of informant 192: "if you mix the paint with water, it won't stay on . . . even if you bake it." To obtain this juice, 32 raked the coals in the fire-pit level with a stick of fire wood, and placed several yucca leaves directly upon the embers. This was done to make the juice flow more easily so that "it comes out better." After the leaves had remained on the coals for a few minutes, they were taken up one at a time and were twisted tightly between the hands (pl. IV, a) in such a way that the juice was wrung out into the container of the pigment (32).

When the leaf would apparently yield no more juice, it was placed back on the coals for a few minutes, and was then wrung out again. When the supply of juice in the leaves had been finally exhausted, they were taken outside and thrown away, without receiving special treatment. The amount of juice which was added to a given quantity of pigment was not measured. The potter simply stirred the paint with a small piece of yucca leaf until she felt that the paint had reached the proper consistency. If the paint were found to be too thick or too thin, more juice or pigment was added as the case might be (32).

Upon cooling, the yucca juice was of the consistency of syrup, which necessitated the repeated addition of warm juice to the mixed paint all the while the painting was in progress (pl. IV, b). Because of this, it was extremely difficult to describe the mean consistency of the paint, which varied from the thickness of milk to that of honey. The paint dried almost as soon as it was applied to the surface of the vessel (32).

While there seems to be little doubt that pottery paints are ordinarily mixed with a yucca juice base, a certain amount of variation was noted. One woman, 14, mixed her pigments with water alone as a medium. She admitted, however, having seen yucca juice used for this purpose when she was girl, but claimed that she did not know enough about this operation to try it herself. Another potter, 32, occasionally added a little water to thin her paints after they had been previously mixed with a yucca juice base. Still another, 36, claimed that some potters mixed a little heated piñon gum with the yucca juice "to make it stick better."

Yellow paint. The pigment is a yellow ocher, *łe·co*, which term is also used to designate the mixed paint (14, 32, 36, 192).[56] Since yellow ocher occurs abundantly in the Ramah area, it is easily accessible.[57] When not in immediate use, the yellow ocher is stored in an unground condition, wrapped in a cloth, and hung up in a burlap sack in the hogan (32, 36). As has been stated above, yellow ocher is used either as a paint or as a slip in the manufacture of pottery vessels, and is also employed in decorating the ritual pipes.

In the preparation of yellow paint or slip—the processes of manufacture are identical for both—the pigment is first ground to a powder.[58] Spreading a cloth out on the ground before her, the potter (32) placed a small, flat slab of sandstone on the cloth to serve as a temporary metate. Onto this were placed several small lumps of yellow ocher, taken from a supply wrapped in a cloth beside her. She then pounded the pigment with a small, water-worn cobble, which functioned at this time as a pounding stone and later as a mano. Holding the cobble in her right hand, she pounded the ocher vigorously. Her left hand was placed alongside the rock slab in order to prevent the chips of ocher from flying about, and now and then she rested her hand on the metate to steady it. When the pigment had been reduced to very small bits, it was ground on the rock slab with a backward and forward movement; the cobble now functioned as a mano. As she ground the ocher, she heaped it with her left hand into a little pile on the far end of the metate.

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[53] Mr. Richard Van Valkenburgh, in a communication to the writer, states that the juice of *Yucca baccata* is used as a medium for pottery paint pigments in the Fort Defiance and Canyon de Chelly areas.

[54] Informant 32 stated that this task is usually performed by a woman's young daughters or by her sons.

[55] Shepard has pointed out that while the addition of a binder of plant extract improves the consistency of the paint, there is no justification for the assumption that organic matter serves as a binder for mineral paint after firing, since this material would be largely burned out. Kidder and Shepard, 1936, pp. 421–422.

[56] This pigment was identified as limonite. Informant 15 stated she had never used yellow as a pottery paint.

[57] Informants 14 and 32 obtained yellow ocher from deposits in the immediate neighborhoods of their hogans. In the case of the latter woman, this material was collected by her son.

[58] Informants 14 and 192 agreed that slips, like paints, should have a yucca juice base.

After the pigment had been ground to a fine powder, a small heap was placed in a concave section of yucca leaf. The quantity was not measured, and the potter (32) simply added the powder to the leaf section a pinch at a time until she felt that she had enough. Yucca juice was next squeezed into the powdered pigment in the manner described above, while the potter stirred the paint with a small yucca leaf stick. If the amount of paint prepared proved insufficient, more was mixed as it was needed.

The mixed paint was slightly more yellow than mustard in color, but it dried on the vessel to a dull mustard shade.

Black paint. This paint is unique among Ramah Navaho pottery paints in that the black pigment is partially mineral and partially vegetable in its derivation. The chief ingredient of this paint is a soft, black, surface coal, *łe·žín*, which is found rather abundantly in the Ramah area.[59] It occurs in stratified shaly masses interbedded in several of the sandstone outcrops of the region, and is so soft that it may be dug with a stick or scraped up with the hands.[60] While black paint is used to decorate pottery vessels and pipes alike, it seems never to have been employed as a slip.[61] As in the case of the yellow ocher, it is often gathered by the potter's children, and is stored either in the condition in which it is found or after it has been roasted with piñon gum (32). Similarly, it is wrapped in a cloth and hung up in a sack in the hogan.

In the preparation of the black paint, the pigment was first ground very fine, "like flour." Then it was placed in an old frying pan and set on the fire to roast. As soon as it began to burn, it was set aside for "just a little while." After it had cooled somewhat, a small amount of piñon gum was added, and the pan was placed back on the fire. It was stirred constantly, and great care was taken lest the highly inflammable gum catch fire. Gradually the sticky mass became quite dry and powdery. This completed the preparation of the pigment, and the pan was set aside to cool (32).

After the pigment was cool, it was again ground in the manner of the yellow ocher. Taking up a little stick, the potter stirred the dry black powder around, removing the coarser bits and impurities with her fingers. Then, after placing a small quantity of the pigment in a yucca leaf section, the potter added yucca juice in exactly the same manner as described for the yellow paint (32).

Informant 32 volunteered an alternate method of preparing black paint, which is identical with the above, save that the basic pigment is different. In this case, the ashes of *cékǫʔ*, "fire stone", were employed.[62] The Franciscans describe the preparation of a black wool dye in which "some native ocher", called by the same name, is prepared in a manner which coincides exactly with the method described above.[63] Pepper has also described this method of black dye preparation, and identifies the pigment as yellow ocher.[64]

Still another method of preparing black paint seems to be employed in the case of the pipes, which are painted after firing. According to informant 36, the black paint used on the hunting pipes is produced by mixing piñon gum with yucca juice. Additional data relating to the preparation of the paints used in decorating the ritual pipes will be presented later in connection with the manufacture of these articles. Since certain ritual observations and requirements accompany the making of pipes, it seems best to treat this subject in its proper context of situation.

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[59] The Franciscan Fathers (1910, p. 293) state that this pigment is boiled with sumac leaves to produce a black dye used in the manufacture of coiled basketry.

[60] This material was identified as lignite.

[61] Informants 15, 32, 36, 192 agreed on this point.

[62] This rather unusual compound proved, upon analysis, to be mendozite ($NaAl(So_4)_2+H_2O$). As it is said to occur rather infrequently in the Ramah-Atarque area proper, the specimen for identification purposes was obtained near Two Wells.

[63] Franciscan Fathers, 1910, p. 230.

[64] Pepper, 1903, p. 10.

In its mixed condition, the lignite is an inky blue-black, but dries on the vessel to a dull, lusterless shade.

Red paint. The pigment used in the manufacture of the red paint is a red ocher, *čí·h*.[65] This material is not uncommon in the Ramah area, although it is said that the best type is not found in the region.[66] Informant 12 possessed some that was traded in from Sunset Crater near Flagstaff, Arizona. Since red ocher figures importantly in ceremonials, it is frequently kept on hand, either in a little buckskin bag, or wrapped in a piece of cloth (32, 36, 192).

Red ocher is used as a paint on vessels, and may also be used as a slip (15, 32, 192).[67] Informant 32 produced a reddish-orange slip by mixing red and yellow paint together in the palm of her hand after they had previously been prepared separately.

The red ocher is gathered, ground, and mixed with the yucca juice in exactly the same manner as described for the yellow paint; again, the preparation of the slip and paint is identical.

When in a liquid state, the red paint is almost blood colored, but it dries on the vessel to a dark reddish-brown.

White slip. The material, *λe·š*, which serves as the pigment for the white paint, is translated by the Franciscan Fathers as "white clay."[68] Interpreter 12 also gave this translation. Upon analysis however, the pigment was found to be almost pure riolitic tuff, with practically no clay content.

This mineral seems to be rather rare in the immediate vicinity of the Ramah area proper, although informant 14 obtained some from the top of a mesa near her hogan. Interpreter 12 secured some by trade from the region between Thoreau and Crown Point.

The tuff is used both as a slip and as a paint in the case of pottery vessels, and is also used in decorating the pipes.[69] The storage of the pigment and the preparation of the slip corresponds in all essentials to the description given of the yellow paint (32, 36, 192).

In the finely ground state, the pigment resembles white flour in color and texture. When mixed with the yucca juice, it is of the color of pea soup, but dries on the vessel to a dirty gray.

Blue paint. The pigment from which the blue paint is made is called *ʔadé·šƛ̓íš* (12, 15, 32, 36). Interpreter 12 translated this as "blue paint," while the Franciscans variously describe it as "a kind of blue clay" and again as "soft turquoise or a similar stone."[70] Analysis, however, revealed the samples collected in the Ramah area area by Kluckhohn to be azurite. With reference to this mineral, informant 1 stated that "you get it often around ruins."

The majority of informants stated that blue paint is never employed to decorate pottery vessels (15, 32, 192). In disagreement with this, informant 36 asserted, "sometimes a little blue paint was used with the other colors to paint the pots."[71]

Although there are references to blue water pots in the songs sung during the preparation of the pot drum for Enemy Way, it seems clear in this instance that we are dealing with the usual color-direction symbolism, and not with references to actual pottery vessels.[72]

On the other hand, it seems certain that blue paint is used to decorate the ritual pipes, a discussion of which will be found in a later section. In the case of these objects, the blue pigment again is said to be *ʔadé·šƛ̓íš* (1, 12, 36).

Fuel

The fuel employed by the Ramah Navaho potters in burning the vessels may be divided into two categories: wood and manure. The choice of the fuel depends upon the type of pottery vessel being fired. Wood, *cin*, is used as fuel in the preliminary fire, which has as its purpose the drying out of the ground where the painted vessels are to be fired (32, 192). It is also employed as kindling during the actual burning of these (32). Manure is the principal fuel during the final firing of the painted vessels, and it is of this material that the oven is constructed (32, 36, 192). The unpainted cooking vessels seem usually to be fired in a wood fire (15, 32, 36, 192).

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[66] This pigment was identified as hematite.

[66] This was the opinion of informants 32 and 192. The former obtained some red ocher of inferior quality from a deposit some ten miles east of her hogan. Since her husband (3) is a singer, this pigment is always kept on hand. A third woman (36) obtained the red ocher that she used from her husband (12).

[67] The use of red paint on pipes will be discussed in the section which deals with their manufacture.

[68] Franciscan Fathers, 1910, p. 65.

[69] The practice of using this material as a slip was verified by informants 14, 32, 36, and 192. Informant 32 alone mentioned its use as a paint, while 15 denied the use of white as either a paint or a slip.

[70] Franciscan Fathers, 1910, pp. 68, 232.

[71] It seems worthy of mention here that this informant alone maintained that vessels were painted after they had been fired.

Informant 32, an old and experienced potter, stated, "I never used blue paint on my pots; no one ever did in the old days."

[72] Father Berard Haile, 1938, pp. 216–217.

The wood is ordinarily piñon or juniper, although others may be used if necessary (32, 192). Since the higher reaches of the Ramah region are well wooded, and since piñon occurs practically everywhere, the wood employed for this purpose is not stored (32). When the vessels are ready to be fired, the potter or her children collect various small sticks and branches in the immediate vicinity of the hogan.[73] Dry wood is preferable, since it burns with less smoke (32). Dry piñon needles are employed as tinder when the fire is kindled.

For fuel used to construct the oven in which the painted vessels are fired, sheep manure, *dibébičan*, is preferred (32, 192). According to informant 32, "If you cook the painted pots in a wood fire, they come out black." This is caused, she believes, by the greater quantity of smoke produced by a wood fire. She also stated that sheep manure makes a hotter fire. In the opinion of informant 192. "You can fire the cooking pots in any kind of fire, but the painted pots must be fired with sheep manure."

The sheep manure is never stored (32, 192). It is simply collected when needed from the sheep corrals, which are usually located near the hogans. There it is allowed to accumulate and be packed down by the hooves of the animals. When it is required in the building of an oven in which the vessels will be fired, the potter goes out to the corral on the day before and digs up slabs of manure with a pointed stick (32). These are turned over and allowed to dry until the time of the firing has arrived.

Piñon Gum

This material, *ǯe·h*, as previously stated, is employed by the Ramah Navaho potters in the preparation of black paint. It is also applied to the surfaces of cooking vessels after they have been removed from the oven (15, 32, 36, 192).

Since piñon trees occur commonly in most parts of the Ramah area, the gum is collected only as it is needed, either by the potter herself or by one of her children.[74] Dried lumps of the pitch are scraped from the trees with the fingers, or with a little stick, and are deposited in an empty can or lard pail. Although large pieces of dirt and bark are removed by the fingers, no serious attempt is made to clean the gum (32). The molten pitch is applied to the hot vessels by means of a green piñon needle brush.

CONSTRUCTION

The techniques of construction involved in the manufacture of Navaho pottery are divided, for the sake of convenience in description, into three principal stages: (1) construction of the base; (2) building the walls; (3) finishing. Whereas the first two stages are identical in the case of both the cooking and painted vessels, the cooking ware receives a somewhat distinct treatment during the finishing processes.

A brief, generalized résumé of Ramah Navaho construction techniques may be summarized at the outset as follows:[75] The potter takes a small lump of paste and models it into a small, low bowl which serves as the base upon which the walls are constructed.[76] Then, producing sausage-like fillets of clay by rolling the lumps of paste between her palms, she adds these around the rim of the base as a series of rings.[77] The suture formed by the addition of a fillet is obliterated with the fingers directly before another is added. What shaping is required in the manufacture of Navaho vessels is accomplished at this time. When the pot has been completed, it is gone over with a moistened corncob, and the walls are scraped in order to make them thinner and more even. The walls are then polished with a smooth pebble or a piece of a gourd. Finally, in the case of the cooking pot, an ornamental fillet of paste is added just below the rim of the vessel, and this may be decorated by means of incisions, punctations, or appliqué.

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[73] In the case of informant 32, the wood was collected by her son (24). Informant 36 collected wood with the help of her young daughters. Informant 14 collected her own wood.

[74] Informant 32 collected piñon gum in a lard pail with the help of her granddaughters. Informant 36 was aided by her young daughters.

[75] "I make a pot," *ʔása·ʔášlé·h*.

[76] For present purposes we define modeling as that technique of construction which depends upon the manipulation of the paste by means of the fingers directly, as opposed to more elaborate means of construction which involve the use of molds or forms.

[77] This technique of construction cannot be designated as "coiling," since the fillets are not applied in a spiral manner. The technique which is employed by the potters of the Ramah Navaho region can be defined as annular construction.

Several vessels are constructed at a time for the sake of speed and convenience (15, 32). For a time the potter works on one vessel, adding one or two fillets around the rim of the growing pot. Then she places this aside to undergo a brief period of drying while work on one of the other vessels is resumed (14, 32). This periodic drying serves to harden the vessel sufficiently so that the walls will not sag under the weight of additional fillets of paste. When the potter is working in a hogan, this drying takes place near the fire-pit (32) or in the sunlight which enters through the smoke-hole (15). If a cooking vessel is being made, sand is brought in and heaped near the fire (32). A depression is made in the top of this heap, and a cloth is placed over it to prevent the sand from sticking to the plastic walls of the vessel (pl. III, c). From time to time, the vessel is turned to dry more evenly (32).

The actual amount of time required in the manufacture of pottery is difficult to determine at present. The fact that women are no longer actively engaged in pottery making, and are doubtless not in practice, serves to invalidate such figures as were obtained. All of the informants were well along in years, and one (32) was quite feeble as well as partially blind. A statement of the observed cases, however, in respect to the time required for the construction of the two types of vessels may not be out of place. Informant 15 completed a cooking pot 18.5 cm. in height, with a maximum rim breadth of 17 cm., in one hour and forty-five minutes, while informant 32 manufactured a bowl 7.5 cm. in height and 15.5 cm. in diameter in approximately forty minutes.

As in the case of the grinding of the clay and the mixing of the paste, the actual construction of the vessels takes place some distance away from the potter's household and family. In the case of informants 15 and 32, the pottery was manufactured in an unoccupied hogan some distance from their residences, while 14 constructed a small shade about forty yards south of the family shade in which to work.

While working on the pottery, the potter assumes one of two postures. In the first (32), an old blanket or a sheep pelt is spread out on the floor. On this the potter kneels, sitting on her heels with her toes turned in. In this position, she holds the growing vessel on her knees during its construction (pl. III, c). A second characteristic working posture is illustrated by informant 15 (pl. II, b). Kneeling on one or both knees, the potter works on the vessel while it is placed on a cloth which has been spread out on the ground in front of her.

Beside her, within convenient range, are arranged the various paraphernalia to be employed in the construction of the pottery (pl. VI, a). To her right stands a lard pail of water which is used from time to time to refresh the paste, to clean her hands, or to moisten the growing vessel (15, 32). The paste is also placed to her right, either in a dampened cloth (32) or in an old metal pan (15). Near her right knee are collected a number of smaller objects which may be required: wiping rags, a corncob to be used in scraping the pot, and polishing stones. If she is working inside a hogan, the potter is forced to move about now and then in order to stay within the circle of light which enters through the smoke-hole (15, 32).

Constructing the Base

As stated above, identical techniques of construction are involved in the actual building of both the cooking pots and the painted vessels.[78] Several handfuls of the paste are pinched from the supply beside the potter, and are then squeezed into a rough lump with the fingers (15, 32). If the vessel under construction is a cooking pot of medium height, the lump will be some three or four inches in diameter (15, 32), but in the case of bowls or small cooking vessels, it is somewhat smaller. Moistening her hands in the lard pail of water beside her, the potter (15, 32) rolls the ball between her palms until it is smooth and round. In modeling the ball of paste into a small bowl which is to serve as the base for further construction, a minor variation was noted. One potter (15) held the ball of paste in her left hand and made a small indentation in the surface with the thumb of her right. Then, with the thumb and index finger of her right hand, she pinched around the edge of the somewhat flattened ball, converting it into a slightly concave disk. Slowly the disk was turned in a clockwise direction by means of the left hand. In this operation, the thumb flattened the concave surface of the disk, the index finger the convex. The right hand was frequently moistened, and the rim and the sides of the base were smoothed with the fingers (pl. I, c). During the modeling of the base, the growing bowl was held in the hollow of the left hand, and was not rested on the potter's knee.

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[78] Whereas detailed observation of construction techniques are available only for informants 15 and 32, the essentials of the operations described above were confirmed by the statements of informants 14, 36, and 192.

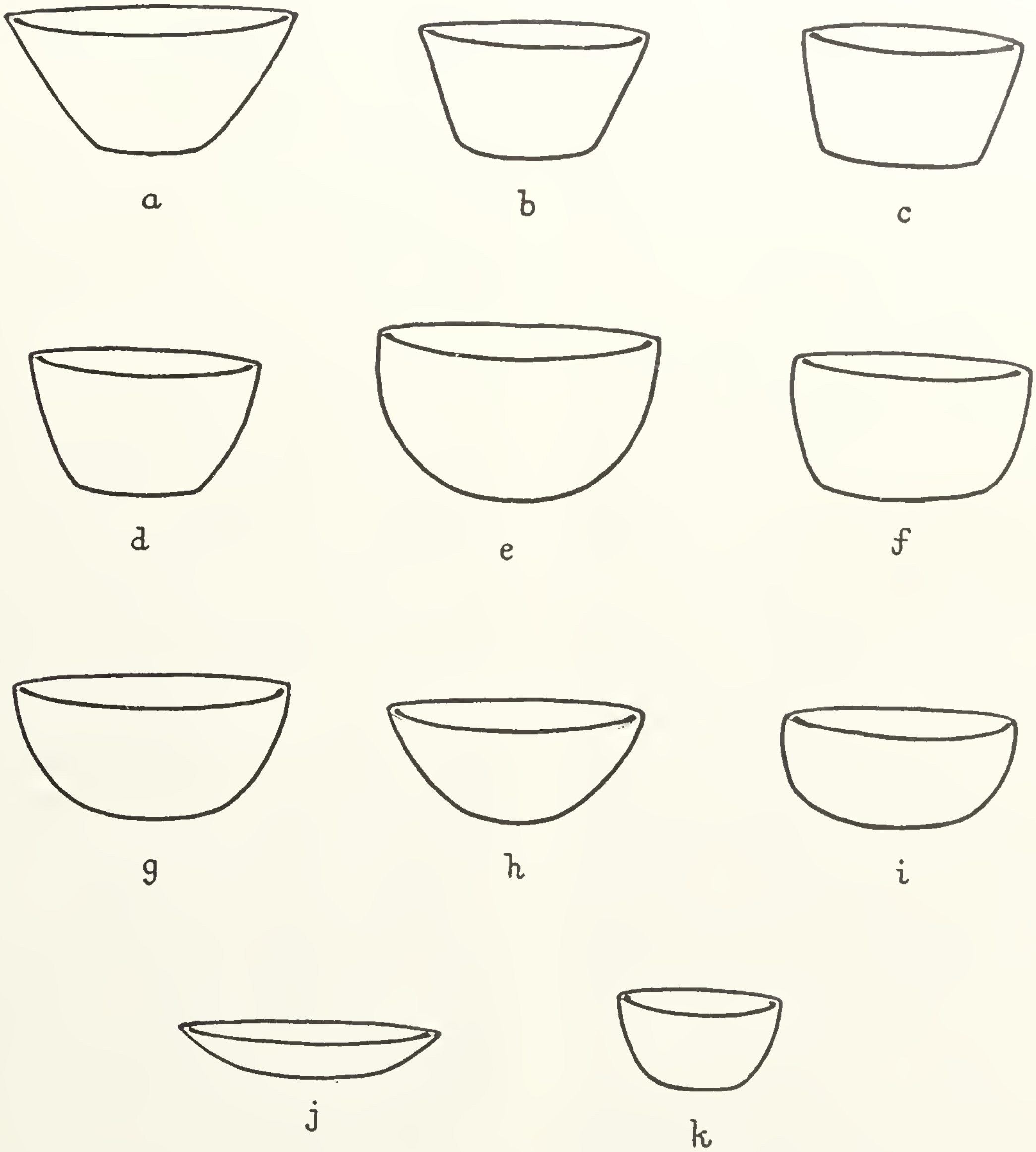

Fig. 3. Navaho painted bowl shapes.

a. Taylor Museum.
b. L. T. MacKinney collection.
c. L. T. MacKinney collection.
d. L. T. MacKinney collection.
e. American Museum of Natural History.
f. Made by informant 32.
g. Museum of Anthropology, University of California.
h. Denver Art Museum.
i. Made by informant 14.
j. Plate. After Hill, 1937.
k. Made by informant 36.

A second potter (32) rolled the paste into a small, smooth ball as before. Then, holding it in both hands, she made an indentation in the surface nearest herself with the thumbs of both hands, using her fingers to hold the ball of paste in place on her lap. She then turned it slowly in a clockwise direction, flattening the concave surface with her two thumbs, the convex with her fingers. During this operation, the base stood on its rim with the convex surface away from her, resting on a cloth spread out in her lap. Holding the base in this position, the potter was forced to work on that portion of the rim immediately under her thumbs until, by rotating the base as described above, another section was brought into this position.

From this point onward, the modeling of the base by the two potters was observed to have been virtually identical. By this time the base has assumed the outline of a low, slightly concave bowl. It is held in the hollow of the left hand, and is slowly turned around just below the level of the potter's eyes, so that she can survey its symmetry (15, 32). If the rim is not properly alined, it is adjusted between the thumb and index finger of the right hand, while the base is slowly turned in a clockwise direction (15, 32). When a satisfactory shape has been achieved, the potter turns her attention to the final step in the construction of the base, that of water smoothing.

Dipping her right hand into the container of water beside her, she moistens the base all over with her fingers (15, 32). First the concave surface is smoothed, principally with the thumb of the right hand. During this operation, her left hand rests in her lap, the base held in the hollow of her upturned palm. Particular attention is paid to the rim, and it is carefully smoothed with the right index finger (15). Then the right hand is again dipped into the water, and the exterior of the base is smoothed, either by the right thumb, with the fingers of the right hand pressing inside the rim; or by means of the fingers, with the thumb placed inside. Finally the base is turned over on the palm of the left hand so that the convex surface faces up, and the bottom is carefully smoothed with water (15, 32). This operation completes the construction of the base.

Building the Walls

The second stage in the construction of a vessel, that of building the walls, follows the completion of the base with no appreciable intervening pause (15, 32). The potter sets the finished base down momentarily, either on a cloth which has been spread out on the ground before her or on her lap, as the case may be. Turning to the supply of paste on her right, she tests its consistency with her fingers (15, 32). If it is found to be too dry, she refreshes the lump by dipping her hands into the water and sprinkling it over the paste. Moistening her hands in the water container by her side, she pinches off a lump of the paste, and then covers over the rest of it with a cloth to keep it from drying out too rapidly (15, 32).

The actual number of fillets to be added to the base depends upon the size to which the finished vessel will attain, as well as its shape. In the manufacture of a cooking pot which measured 18.5 cm. in height, informant 15 added four concentrically arranged fillets to the base; while informant 32, in constructing a bowl measuring 7.5 cm. in height, added two fillets to the initially prepared base. The diameter of the fillet, *baká*ʔ*-áxéñti·*ʔ, is relatively uniform (approximately 3 cm.) for whatever type vessel may be under construction, although it may vary in length from eight to twelve inches. A certain amount of skill seems to be required in the production of the fillets, which may account for a variation noted in the cases of two informants.

The first (32), an older and more competent potter, rolled the lump of paste between her palms into a roughly spheroid shape by means of a slightly rotary motion (pl. III, b). Then, opposing her palms before her in vertical position, she rolled the ball of clay between them with a reverse backward and forward motion, applying more or less uniform pressure throughout the operation.[79] This resulted in a fillet of paste about twelve inches long which emerged pendent from between her palms. While the circumference of the vessel under construction was never actually measured, fillets of sufficient length were consistently produced so as to encircle completely the rim of the growing vessel.

A second potter (15), somewhat less skilled, modeled the lump of paste between her fingers until it assumed the rough outline of a sausage (pl. I, d). This was then rolled between the palms in the manner previously described. Her fillets, however, only rarely and quite by accident equaled the circumference of the vessel under construction. She explained her technical deficiency by stating that if but one long fillet were added, it would be apt to crack. Both potters rolled out but one fillet at a time, which was incorporated into the growing vessel before another was produced.

As soon as the first fillet has been created, it is added around the rim of the base in such a way that it rests squarely on top of the latter (15, 32). After the binding operation has been completed, the initial coil overlaps the rim of the base equally on both the interior and exterior surfaces (15, 32). This type of fillet junction, which would be seen in cross-section as an inverted "U", is effected by the manner of the sutural obliteration. Two variations were noted in the method of addition of fillets and the obliteration of their sutures.

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[79] "I roll the clay," ʔ*ása·*ʔ *hašƛ̓iš yí·sdis.*

One potter (32) took up the base and placed it on a cloth which had been spread out in her lap. Then, taking the fillet of paste in her right hand, she pinched one end of it to the mid-point of the rim farthest away from her with the fingers of her left hand. Feeding the fillet with her right hand, she carried it around the circumference of the rim in a clockwise direction until the rim had been completely encircled with the single fillet, a technique which has been referred to above as annular construction. In this operation, the right hand which fed the fillet was followed up by the left, the latter functioning in pinching the fillet of paste firmly to the base at intervals of about one and one-half inches until the ends of the fillet were united. As soon as this operation had been completed, she set about to obliterate the juncture. The obliteration was begun on the interior surface of the far rim, pressure being exerted by the thumbs inside and the fingers, pointing downward, outside (pl. III, c). Slowly the vessel on her lap was turned around in a clockwise direction so that eventually the suture on the interior surface was erased by her thumbs. Next the suture on the exterior surface of the vessel was obliterated, although the first step in this direction was made by the fingers, while the thumbs bonded the fillet to the base inside. This was effected by means of a sliding movement of the fingers on the exterior surface of the vessel as they opposed the thumbs within (pl. III, c). Finally the rim was straightened between the thumbs and the index fingers of both hands while the vessel was slowly turned in a clockwise direction.

A second potter (15) placed the base on a piece of canvas which had been spread out on the ground before her. After producing a short fillet in the manner described above, she held it in her left hand, and applied one end of it to the mid-point of the far rim. With her right thumb and index finger, she pinched this into position while with her left hand she carried the fillet around the rim in a counter-clockwise direction (pl. II, a). Then, holding the base steady with her right hand, she pinched the fillet into position with her left, proceeding from the far rim around towards herself. The fillet, however, was only half long enough to encircle the base. Rolling out another small fillet, she added it around the rim in a clockwise direction, holding the base in position with her left hand. Then, because the point of juncture of the two fillets on the side nearest her proved to be lower than the remainder of the rim, an additional pellet of paste was added with the right hand, and welded into position with both thumbs. In the obliteration of the suture between the initial fillet and the base, the vessel was not turned as in the case of the potter previously described. Gripping the rim nearest herself so that the fingers pressed inside, she erased the suture on the exterior surface with both of her thumbs (pl. II, b, c). With her two hands in this position, she worked around laterally in both directions. As soon as this position became ineffectual, she grasped the rim farthest from her so that the thumbs pressed inside, while the fingers obliterated the junction on the exterior surface. Again each hand worked around laterally, this time towards herself. Eventually each of the sutures had been completely obliterated both inside and out.

In the case of this second potter, each successive fillet was added in the same manner as was the first, usually in two or three unequal lengths, each of which averaged about three centimeters in thickness. It was not observed that any particular attention was paid to the directions in which these fillets were added, and, while some were attached around the rim in a clockwise direction, the reverse situation was true of others.[80] In each case, however, the various segments of the fillets were attached in such a way as to produce superimposed concentric rings. Both potters, after adding a complete circuit of paste around the rim of the growing vessel, entirely obliterated the resulting suture before preparing or adding another fillet. Before the addition of each successive fillet, the rim formed by the previous one was carefully smoothed and moistened.

As the vessel grows in size with the addition of fillets, it is constantly being shaped with the hands (15, 32, 192). One potter (14) used an ordinary corn husk as a kind of glove for the right hand during the construction of her vessels. The corn husk was first dipped into cold water "to make it soft."

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[80] Informants 32 and 192 maintained that fillets should always be added in a sun-wise (clockwise) direction. Informant 15 agreed with this contention, and added further that the junctures of the fillet circuits should come one over the other to form a "doorway". The above shows in the case of 192 that her theories were not borne out in practice.

When the shoulder of the *ʔásaˑʔ* had been reached, informant 32 scraped the exterior surface of the vessel with a charred corncob. Only once during the construction of the vessel was this done, and the polishing stone was not employed at this time. According to informant 192, a vessel is scraped with a corncob and stone-polished inside and out during the actual building of the walls. Informant 15 maintained that a pot should not be scraped and polished until after the construction has been completed.

If the vessel is placed on the potter's lap during the construction (32), it is slowly turned in a clockwise direction, and the far rim constantly receives attention. If, however, the vessel rests on a cloth spread out on the ground before the potter, the incipient vessel is not turned, and no particular arc of the rim functions as work-surface (15).

From time to time the potter holds the vessel at a distance in the hollow of her hand, and turns it around slowly in order to see that it is symmetrical (15, 32). When the rim is not of equal height all the way around, little pellets of paste are pinched from the nearby supply and added at the low points (15, 32). Small irregularities of both the interior and exterior surfaces are filled in with additional pellets of paste, and are then smoothed over with the index finger of the right hand (15). Where the rim is too thick or when it is slightly out of alinement, it is pinched into shape between the thumb and the index finger (15, 32). Now and then small cracks appear in the walls of the vessel, and these are immediately smoothed over with the moistened index finger (15). If they are larger, pellets of paste are introduced into them and the surface is then smoothed.

The technique of building the walls, from the time that the first fillet has been added until the desired height and shape have been achieved, proceeds essentially as described above. When this has been accomplished, the vessel is ready to receive the finishing.

Finishing

Immediately after completing the construction of the vessels, the potter sets about to apply the finishing processes. These may be said to consist of two phases: scraping and polishing. The purpose of the finishing processes is to reduce the thickness of the walls of the vessels, and also to provide a smooth surface which may later, in the case of some vessels, be painted. It is in respect to the finishing that Navaho pottery departs so widely from the best Pueblo ceramic tradition. If one can judge from the collections available in museums, the carefully finished Navaho vessel is the exception rather than the rule.

A close examination of the surface of most Navaho vessels usually discloses two sets of superficial markings. The first, sets of fine parallel striations, are probably due to scraping with a corncob. The second set, which usually overlays the first, is seen as a series of short, shallow indentations which are almost certainly due to polishing with a pebble or a piece of a gourd.

All wet paste decoration, such as the application of the decorative fillets around the rim of the cooking pots, as well as the addition of handles, *bitášžaˑʔ*, to the water bottles, is accomplished at this time. No vessels with handles were observed during their manufacture. Informants 32 and 192 stated that the handles to be seen on the water bottles (pls. IX, a; XI, d, d′, e) are of the strap variety, either oval or round in cross-section. These handles are made separately and then applied to the walls of the vessels. Both women maintained that the walls are never perforated to facilitate the application of handles. The latter informant was unfamiliar with the button-type handles adorning the water bottle (pl. IX, e, e′) which she had found in a cache, although she was certain that this vessel was of Navaho origin.

As soon as she had completed a cooking vessel, the potter (32) took up a small, charred corncob and dipped it into the water container. The vessel rested on a cloth in her lap, and was directed mouth upward, leaning slightly to the left. The fingers of her left hand supported the rim from within in order to prevent the pliable paste from sagging. The corncob was held in the right hand, and was scraped over the exterior surface with a motion directed upward from the bottom toward the rim (pl. III, d). The corncob was frequently dipped into the water to prevent it from collecting too much clay. Since the walls were not yet hard enough to polish, the potter placed the vessel, as described previously, in the pile of sand near the firepit to dry for a short while. After the vessel had dried sufficiently, she added the decorative fillet around the rim in the manner to be described below. As soon as the decoration had been completed, she wet her fingers and moistened the surface of the vessel all over. Then, taking up a polishing stone in her right hand, she polished the exterior surface of the vessel with short, deft strokes. These were usually directed from the bottom of the vessel upward, as was the case with the corncob scraper.

This informant maintained that, because of their constricted forms, most cooking vessels are polished only on the outside, although bowls are polished on both surfaces. Informants 15 and 192 stated that all vessels are polished both inside and outside after the construction has been completed. Both of these women asserted that vessels are not polished after they have received their final drying.

The length of time required to polish the vessels seems to be quite variable. Informant 32 polished two bowls in twenty minutes, while 14 polished three in approximately two and one-half hours. With the completion of the polishing process, the vessels are finished, and are ready to be dried.

Wet Paste Decoration. It is in regard to this phase of the finishing stage that the stylistic dichotomy, which has been discussed previously, again manifests itself. The vessels classed by the Navaho under the generic term ʔ*ása·*ʔ are decorated at this time by means of various techniques of appliqué and incision, whereas those which are to be painted receive no further treatment until after they have dried.

Since the details of wet paste decoration are of almost infinite variation, they will be treated here only in the most summary fashion. Additional details and illustrations of motifs are given by Hill[81] and Douglas.[82]

In general the decoration consists of one or more fillets of paste which encircle the neck of the cooking pot below the rim.[83] These fillets may either comprise the sole decoration or be ornamented in addition by incisions or punctations. Whereas the designs on painted vessels are occasionally realistic or semi-naturalistic, the decoration applied to the cooking vessels seems invariably to be geometric, and to vary widely from simple raised bands (pl. IX, f-h) to fairly complicated motifs (pl. IX, i).

As soon as informant 15 completed the construction of a cooking vessel, she began to add the ornamental fillet around the neck of the pot, just below the lip of the rim (pl. II, d). Rolling out a thin fillet of paste, she pinched off little strips and added them clockwise around the vessel to form a raised zig-zag pattern. Each strip was pinched along the edges to make it adhere to the surface of the walls. The obliteration of the juncture was accomplished by the thumb of her right hand, while her left hand steadied the rim of the vessel. Then, moistening her right index finger, she ran it along the sides of the elevated pattern to achieve a smooth transition. No break or "doorway" was left in the design. As soon as she had finished adding the zig-zag fillet, she took up a burned match stick in her right hand and made a series of punctations clockwise around the elevated band (pl. III, a).

Informant 32, after she had allowed the cooking vessel to dry by the fire for a short time, proceeded to add a decorative fillet around the rim in the manner described above, except that a "doorway" was left in the design (pl. IX, f). Then she took up a match stick and made a series of indentations with the side of it, working around the raised band in a clockwise direction. With her right thumb she went over the indentations and pressed them down slightly, so that the edges would not be too sharp.

According to Hill, "the decorative elements or the fillet never completely encircled the pot. This break was called ʔ*ati·n* 'trail'."[84] Among the Ramah informants, a certain amount of disagreement prevailed in respect to these two points. Informants 32 and 192 stated that the "doorway" is called ʔ*atį́·*ʔ, "trail", while 15 referred to this feature as *hadane·sce*ʔ. According to this latter woman, "trail" is used only to refer to the "doorway" in ceremonial baskets. As to the use of this feature in pottery, informant 32 maintained that it should always be present on cooking pots. "If you don't leave one, you will go blind." This woman stated that "doorway" is omitted in the case of the painted bowls, since "they are open on top." The reverse position was maintained by informant 192, who stated that she never left a "doorway" in the designs which she used to employ on her cooking vessels, but always was careful to see that such a break should be left in the motifs that she used to paint on bowls. Again, although 15 stated that a break should always be left in the band which encircles the neck of a cooking pot, she omitted this feature entirely on the vessel that she made for the writer. Three characteristic methods of breaking this encircling band are shown in fig. 4, f–h.

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[81] Hill, 1937, pp. 14–16, fig. 2.

[82] Douglas, 1937.

[83] Statements by informants 15, 32, and 192 tend to bear out Hill's findings to the effect that, in the central and eastern Navaho areas, the last fillet added in the building of the wall was not made larger to serve as the basis for decoration. The practice of making the last fillet larger than the others is characteristic of the western Navaho (1937, p 14).

[84] Hill, 1937, p. 16.

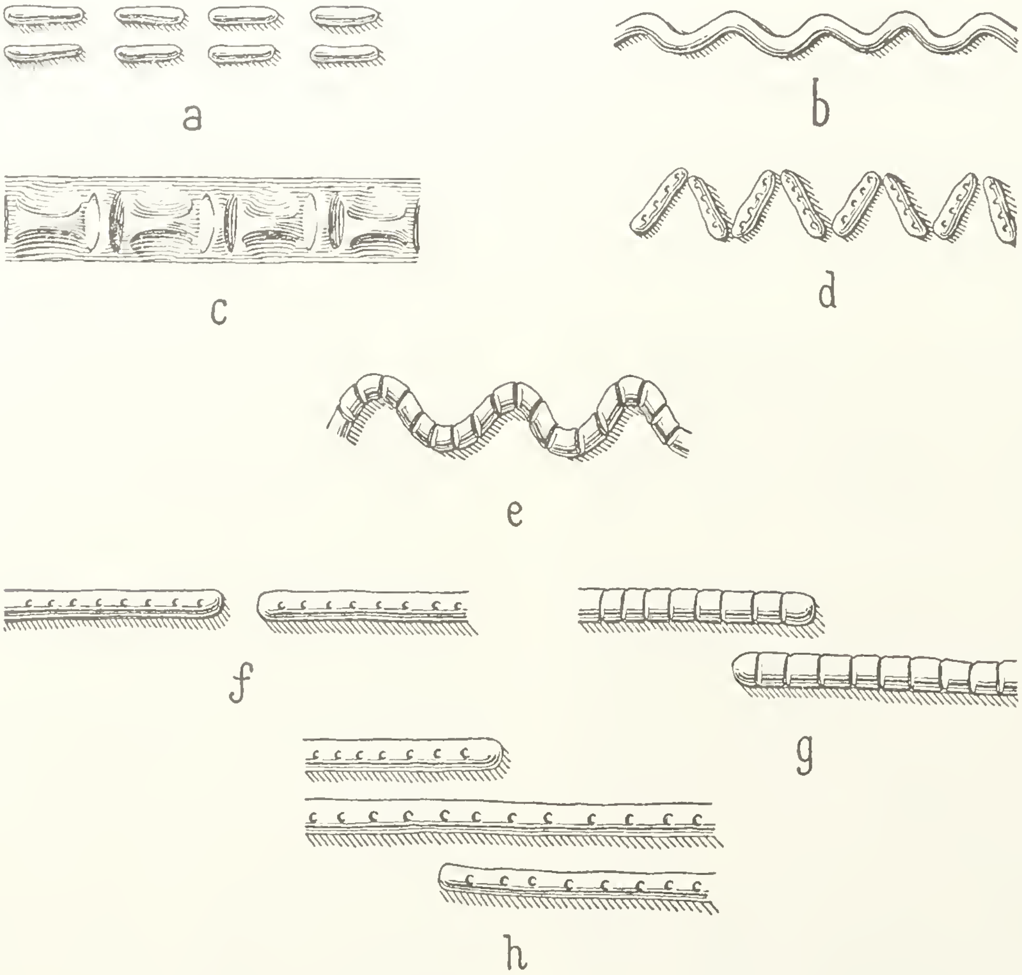

Fig. 4. Wet paste decoration. a–e, filleted neck decoration. f–h, "doorway" arrangements.

The generic term for this filleted neck-band decoration seems to be *bi·yo·ʔ*, "the pot's beads" (15, 32, 36, 192). This term is further modified by descriptive suffixes as: *bi·yo·ʔno·lƛ̓i·ž* (fig. 4, b, c, d), "crooked beads" (32, 192); *bi·yo·ʔdanazkêh* (fig. 4, a), "Beads hang together" (192); *bi·yo·ʔdascih* (fig. 4, e), "bead which points long and narrow" (192). Another type of decoration which is confined to the cooking vessels consists of indentations around the lip of the rim, *bidá·ʔ*. These are called *bidá·ʔaxénáško·l*, "marks around the rim" (15, 32, 192). According to 192, the rims of cooking vessels are never decorated by scalloping,[85] nor are they notched at one point to indicate the east. This is curious, since a small cooking pot with the latter type decoration was collected in the Ramah area (pl. IX, g).

DRYING

After the vessels have been completed, they must be allowed to dry thoroughly before they can be fired. The actual purpose of the drying is to permit the paste to become hard and to drive off as much of the moisture content as is possible. Unless this is done, the water contained within the paste may expand when the vessel is subjected to heat, thus causing it to crack. "If you bake it when it is damp, it breaks to pieces in the fire" (192).

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[85] Cf. Hill, 1937, p. 16.

A difference of opinion exists among the potters as to where the vessels should be dried as well as to the duration of this process. Informant 15 stated that the vessels should be left to dry in the hogan for two days. "You have to dry a pot in the shade; if you dry it in the sun, it will crack. And if you dry them outside, it might rain on them. You have to watch them all the time." Other potters, however, asserted that, under proper weather conditions, the pots might be allowed to dry for three days out of doors in the sun (14, 32, 192). Should it be windy outside, the pottery is brought into the hogan to dry. "The wind makes it split bad" (32). This woman stated that the vessels are also brought inside to dry if the sky is overcast, or if rain threatens.

If the drying is to be done inside the hogan, the vessels must be moved about frequently in order to keep them within the circle of sunlight which enters through the smoke-hole (15, 32). On dark days, the vessels may also be placed around in the ashes to dry by the fire. If this is done, they must be turned now and then in order that they will dry evenly and will not crack (32).

Vessels occasionally crack during the drying. In the case of the cooking pot made by informant 15, large vertical cracks appeared in the body of the vessel from base to rim. When the potter attempted to pick it up, the pot broke into several pieces. The blame for this mishap was placed on the clay, which she had originally said was unsuited for pottery making. It should be pointed out, however, that she had refused to add any tempering material to the paste.

Whereas small cracks which appear during the drying may be mended by filling them in with pellets of paste, no attempt is made to repair badly cracked vessels.[86] In such cases, the clay may be reused (15, 32, 192). One batch of pottery made by informant 32 was smashed when her grandchildren broke into the hogan where the vessels were drying. The potter collected the fragments, ground them, mixed the clay with water, and kneaded the paste a second time.

A potter can tell when the vessels have become thoroughly dry by the ring produced when the walls are tapped or thumped (32, 192). "You watch the pot all the time it is drying. If you tap it now and then, you can tell by the sound when it is dry" (15).

After the vessels have been dried, the cooking ware receives no further attention until the firing. The other vessels are now ready for slipping and painting.

SLIPPING

Up to this point the manufacturing processes of the two styles, with the exception of the wet paste decoration applied to cooking vessels, have been virtually identical. But whereas the cooking ware receives no further treatment until after firing, the other ware, after the drying has been completed, is slipped, polished, and painted. Several aspects of the slipping and painting as practiced by the Ramah Navaho, are extremely interesting, and seem to have no precise equivalents in the Southwest. The relationship of these techniques to those employed by the neighboring Pueblo groups will be discussed somewhat later.

In Guthe's words, "Slipping is the application of a very thin layer of clay to the surface or surfaces of the vessel to produce a smooth texture, uniform in color, which gives the pottery a pleasing appearance; it also serves as a background upon which the designs may be painted."[87] It seems probable that these are the "motives" which prompt the Navaho potter to surface her vessels in this manner.[88] On the other hand, the slip prepared by the Ramah Navaho potters in repect to its composition, must be regarded primarily as a paint. As previously stated, the methods employed in the manufacture of slips and paints are identical. Linguistic usage, however, serves to indicate that slipping and painting are considered to be separate processes, or, at least, separate phases of the same process. Whereas the term for "I slip the pot white" (literally, "pot, I whiten it") is *ʔása·ʔ yišλe·š*, the term for "I paint the pot" is *ʔása·ʔ bikína ʔazǫ*[89] (32, 192).

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[86] Informant 15 mended the first crack that appeared in her cooking pot in this manner; 36 sealed small cracks which appeared in a bowl during the drying by moistening the wall of the vessel and smoothing the surface with her fingers.

[87] Guthe, 1925, p. 57.

[88] Data regarding the slipping of pottery vessels is somewhat inconsistent in the literature. The Franciscan Fathers (1910, pp. 285–289) do not mention this practice. On the other hand, Hill (1937, pp. 17–18) states that among the western Navaho, bowls and trays were slipped red, while red, yellow, or white slips were employed in the central and eastern areas.

[89] Similarly, "I slip the pot red" is *ʔása·ʔ yiščí·h* (192).

The Ramah Navaho potters seem formerly to have employed slips of three different colors: red, yellow, and white (32, 14, 36, 192). A fourth slip, a mixture of the red and yellow slips to produce an orange, might also be enumerated. One potter (15), however, stated that she had only used the red slip herself, but agreed that yellow and white slips formerly were utilized by other women.

In respect to the socially sanctioned color combinations, the range seems to be surprisingly large.[90] Some vessels are slipped red and painted with black designs, while others receive a white slip and are then decorated with red, yellow, black, or a combination of these colors (32, 36) A bowl might be slipped one color inside and another outside (14, 32, 36, 192).

As in the case of the preparation of the paste and the actual construction of the vessels, the slipping and painting are carried on at a spot some distance removed from the other members of the community (32). While this potter wiped the recently dried vessels with a cloth in order to remove bits of dust and dirt, her grandson (24) went out to find a yucca plant. The juice was to be utilized in the manner previously described as a vehicle for the pigments, while paint containers and brushes were to be manufactured from the leaves. While he was away, the potter ground the several pigments and arranged the various paraphernalia which were to be used during the slipping and painting. Upon returning with the yucca, the grandson prepared the slips and paints under the potter's direction; the order of their preparation was yellow, black, white, and red. The white slip was mixed in an old enamelled cup since a quantity was needed to slip the largest bowl.

As soon as this had been done, the potter took up the cup of slip and tested its consistency with a sliver of yucca leaf. Since the mixture was rather sticky, she decided that more yucca juice was needed. The grandson removed a large leaf from the coals and squeezed its contents into the cup while the potter stirred the slip with the sliver. Then she tested the consistency again and discovered that the mixture was too thin. Consequently she added several more pinches of the white pigment from the package on her right.

Satisfied at last with the consistency of the slip, the potter placed the bowl on its side against her left knee, holding it by the rim with her left hand. Dipping her right hand into the cup, she smeared the slip over the convex surface of the bowl with her fingers (pl. IV, b). She claimed that brushes and mops are never employed for this purpose.[91] Since the slip was rather thick, it covered the surface unevenly and produced a rough surface texture. As soon as the exterior had been slipped in this manner, she allowed the bowl to rest on its rim for several minutes until it was quite dry. Then she placed the bowl upside down in the hollow of her left hand and dusted off the loose particles of slip with the fingers of her right. The application of the slip to the exterior of the bowl exhausted the supply so that a second cupful had to be mixed. After this had been done, she rested the bowl again in her left hand, tilting it slightly at an angle so that she could apply the slip to the interior surface (pl. IV, c). Dipping her right index finger into the cup, she smeared it around inside the bowl. Within several minutes the slipping had been completed, and the bowl was set down on a cloth until it was dry.

The red yellow slips were applied in accord with the techniques described above. In the cases observed, only informant 14 polished her vessels after they had been slipped. Other informants, however, agreed that this was formerly done with a smooth polishing stone before the vessels were completely dry (32, 192).

Vessels seem not to be slipped in a batch before they are painted. As soon as the slip is applied to a single vessel and the polishing completed, the painting is begun (32).

Two exceptions to the method of applying slip described above were noted. When informant 32 slipped a small bowl orange, she spread the yellow paint in the palm of her left hand and mixed a small quantity of the red paint into it. Then, into her open palm containing the paint, her grandson squeezed some yucca juice. She then mixed this slip, using the index finger of her right hand, and applied it to the vessel as before.

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[90] Informant 32 maintained that any number and combination of colors are acceptable. But according to 192, one should never use more than three colors on a vessel.

[91] Informants 14 and 192 were in agreement on this point. This operation is also illustrated by Hill, 1937, pl. II, d.

A second potter, 14, mixed the slip clay with a small quantity of water in the palm of her left hand. The mixture was then patted and rubbed with the fingers of the right hand onto the surface of the vessel, both inside and out. As previously stated, she had heard of yucca juice being substituted in this context, but did not choose to attempt it herself.

PAINTING

Three paints, which have been described previously, were employed until recently in painting the designs: red, yellow, and black. An orange, obtained by mixing the red and yellow paints, seems also to have been used for this purpose.

Primary lines may be painted with any of the three colors, although black seems to be used primarily for this purpose.[92] The latter paint, apparently, is rarely employed for filling solid areas in cases where two or more colors are used in the design. Since all of the paints are mixed with a substantial yucca juice "body", the lines are noticeably raised when the paint becomes dry. In the painting, a separate brush is manufactured from yucca leaf for each color, and several small stirring sticks of this material are also prepared (32, 192). When not actually in use, the brush rests either in the paint container or beside it; frequently it is placed across the rims of the leaf section (pl. IV, d). All brushes are of a single weight, since no discrimination is drawn between brushes employed in delineating designs and those used to fill in solid areas (32, 192).

Mechanics of Painting

As soon as a single vessel has been slipped, the painting is begun (32). During the painting, the brush is held in one of two positions depending upon the portion of the vessel being painted. In decorating the exterior of a vessel, the brush is held in the right hand as though it were a pencil (pl. V, b). In this position, the axis of the hand is nearly vertical, and the thumb opposes the second finger with the brush between. The index finger rests on top of the brush and appears to be the principal agent by means of which the stroke is controlled. In this position, the brush is gripped either midway along the shaft or somewhat nearer the point. A second position is assumed when painting a curving line in a horizontal plane (such as the design being drawn in pl. IV, d). Here the axis of the hand is more nearly horizontal; the brush is held between the thumb below and the first and second fingers above. When the brush is held in this manner, the shaft is gripped some distance behind the center, farther away from the point.

At no time during the painting are the fingers of the right hand rested upon the surface of the vessel. The movement of the arm is completely free and unhampered, although the elbow may on occasion be steadied against the body (32). In spite of this, however, the brush strokes are short and mincing. There is no sweeping movement to the lines, and each is drawn slowly and painstakingly. A single stroke never exceeds an inch and a half, and the vessel is not turned when drawing a line. This precise method of painting probably results from the thick consistency of the paint and the small size of the vessels being decorated rather than from any willful exactitude on the part of the potter. After each stroke, the brush is dipped and excess paint is removed by drawing the tip of the brush across the rim of the paint container (32).

During the painting, the angle formed by the brush with the horizontal plane depends upon the portion of the vessel which is being painted. When painting a circular motif in the horizontal plane, the brush itself is held almost horizontally so that the resulting line is produced by the flat side of the brush tip rather than by the point itself. In practically all other cases, the brush is held at an angle of approximately forty-five degrees; never did the angle approach ninety degrees (32).

Because of the thickness of the paint and the inflexible nature of the brush tip, it is extremely difficult for the potter to produce lines of constant width. In the main they are rather broad, with ill-defined edges. No particular attempt is made to achieve long lines of equal breadth or intensity of color, and frequently they are retouched along the whole length. The consecutive strokes used to produce a line frequently overlap, and others often do not quite meet (32).

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[92] This generalization, referring to cases using two or more colors in the actual designs, is based principally on a study of painted Navaho vessels in museums. Primary lines may be defined here as those which outline the various design elements and divide the decorated zones into blocks which may then be filled in with other colors.

It is interesting to note that in certain types of painting, the potter occasionally employs the index finger of her right hand for this purpose. When painting the rim of a small bowl, informant 32 dipped her finger into the paint and smeared it upon the lip of the rim. Again, when painting a circular design on the bottom of a bowl, she drew the line in first with a brush, and then filled it in solid with her finger. In filling in so large an area, her finger is of obvious advantage, since it would be a lengthy process if done with the sharpened brush. From time to time she wiped her finger in the earth on the hogan floor to remove the excess paint. Finger, painting, however, is probably not to be regarded as a regular procedure, since similar lines were drawn and areas filled in with the usual paint brush.

In painting the bottom of a bowl, the vessel is inverted over the spreading fingers of the left hand, which results in the decoration of the horizontal alinement of the plane (pl. IV, d). When the exterior walls of the bowl are decorated, the vessel is placed on its rim, the under side being protected by a cloth in order to prevent the slipped surface from becoming soiled (pl. V, a). While the vessel rests in this position, the fingers of the left hand support the rim from beneath. In this position, the area to receive the decoration is again oriented approximately in the horizontal plane, although sloping slightly to the potter's right. From the potter's point of view, the vessel in this position is alined somewhat diagonally right to left in as much as the axis of the rim tends to parallel her left fore arm (32).

When horizontal lines, or diagonals which slope away from herself, are painted on the shoulder of the bowl, the strokes are made by drawing the brush towards herself. If vertical lines, or diagonals which slant toward herself, are being drawn, the brush strokes are directed at right angles to the rim axis of the vessel, i.e., from left to right. The brush strokes seem never to be directed away from the potter (32).

Designs

A rather wide variety of designs seems to have been employed by the Ramah Navaho potters in decorating painted vessels, although observational information regarding vessels other than bowls was lacking. Whereas some vessels were simply slipped and fired without further decoration, as in the case of the bowls manufactured by informant 14, others were painted with either geometric or naturalistic motifs.[93]

The geometric designs varied from simple lines and dots to motifs composed of fairly complex elements. The simplest type of decoration is exemplified on a bowl made by informant 32 (pl. VIII, b). As soon as the vessel had been slipped orange, she painted the lip of the rim red and then drew a wavy red line around the exterior face of the rim. Following this, a similar line was painted in black around the interior surface of the rim. She claims that this design has no name. Informant 36 made a similar claim for the design to be seen on the vessel illustrated in pl. VIII, a.

More elaborate geometrical designs drawn by 36 may be seen in fig. 5. One, fig. 5, a, is called *bík̓ˀeščį*, "pattern." A second design, pl. VIII, a, is quite different in type, but is called by the same nondescript term. The third, fig. 5, b, is called *bítaznezk̓ą́ˀ*, "triangle (standing up)."

The type of painted decoration employed seems to vary considerably from one potter to the next. Informant 15 asserted that she had never used animal motifs, "just crooked lines and dots." Informant 192 denied that animal, bird, or plant motifs were ever used to decorate pottery vessels.[94] Other potters (32 and 36) employed either geometric or naturalistic elements, although these were said not to have been combined on a single vessel. These potters stated that formerly various animal motifs were painted on the vessels—deer, elk and antelope. It was stated, however, that bird and flower patterns were not used. Furthermore, certain classes of natural phenomena such as snakes, bear, and lightning, because they were closely associated with the supernatural, were therefore considered to be unsuited for representation on pottery (15, 32, 192).

Representations of deer, elk and antelope, on the other hand, might occur on pottery vessels. Such a design, which had been seen on the exterior of a bowl, was drawn for the writer by informant 36 (fig. 5, a). From left to right the animals are: *ǯa·dí*, "antelope"; *ʒé·h*, "elk"; *bį·hbakq̨ʔigí*, "male deer"; *bį·hbaʔá·digí*, "female deer." Each animal is outlined in black on a white ground; the interior of the bowl is slipped yellow. The animals proceed around the bowl in a clockwise direction, and the black animal must always be drawn first. There is nothing in the design to indicate the east, but the animals are said to be running "as though they are going to the east" (36).

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[93] Hill illustrates a number of bowl designs drawn by his informants (1937, fig. 3).

[94] Miss Flora Bailey informed the writer she had seen in 192's possession a painted Navaho vessel with animal motifs.

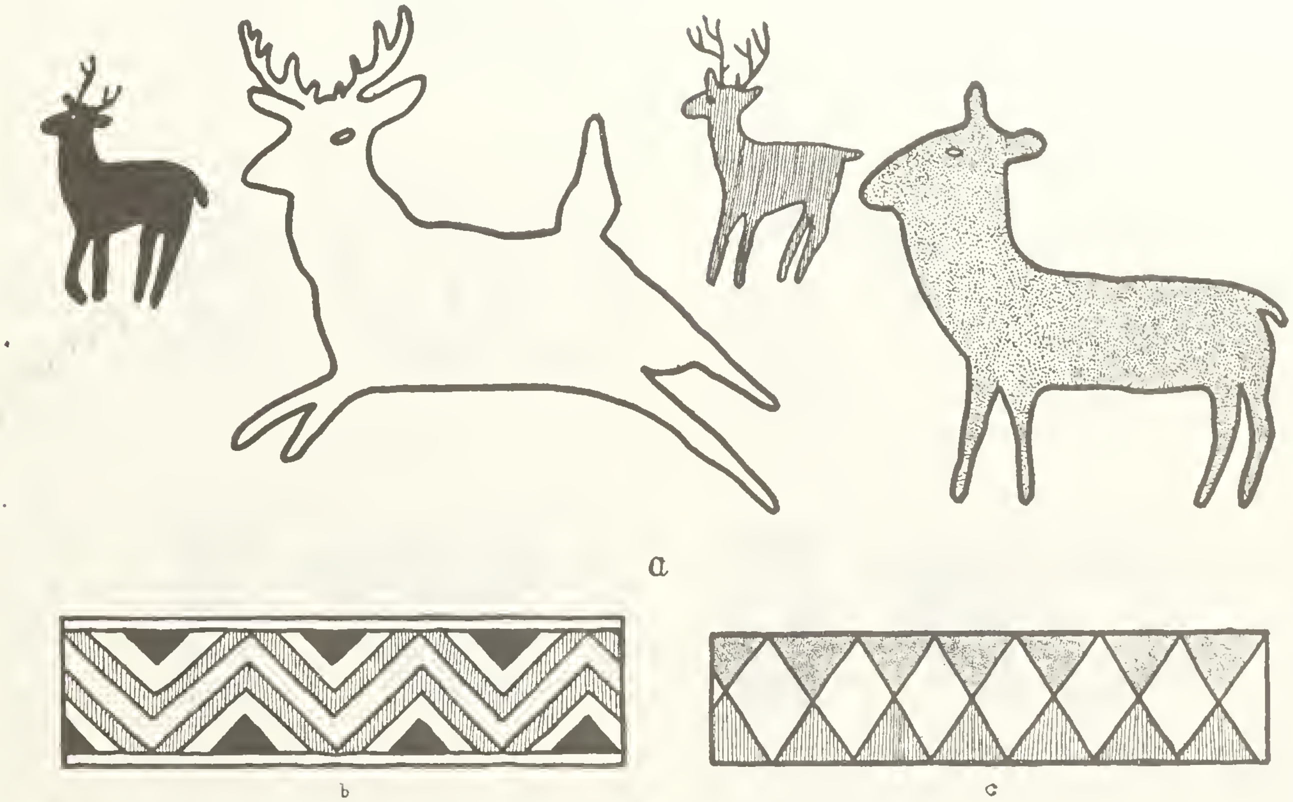

Fig. 5. Navaho painted pottery designs drawn by 36.

Whereas the data are far from being sufficient, it seems improbable that symbolism, in the accepted usage of the word, constituted an important factor in regard to pottery designs. That secondary meanings were read into these is not unlikely, since this phenomenon seems to have occurred in the case of basketry motifs, and also with respect to the patterns which appear on Navaho blankets.[95]

The "doorway," which is characteristically present in the decorative rim fillet of the *ʔása·ʔ*, need not be left in a design which occurs on a bowl, "because it is all open inside" (32). Informant 15, however, insisted that this feature must always be present, and claimed that she used to leave a broken line around all the rims of her painted bowls. As has been stated previously, informant 192 omitted the "doorway" in the case of the rim-filleted cooking vessels, but insisted that this feature should always be present on painted bowls.

The zoning of design elements on Navaho painted vessels seems to have been relatively simple. In the bowl, the zone of greatest elaboration, in the Ramah area to be sure, was the shoulder of the vessel. The geometric motifs tended to take the form of repeated identical or similar elements, confined either between horizontal bands or without them. Panels and medallions were apparently not in favor. The foregoing may be said also to apply in the case of the somewhat less common naturalistic motifs. The lip of the rim seems almost invariably to have been painted, while lines both on the interior and exterior surfaces of the rim were not uncommon. According to informants 32, 36, and 192, the interiors of bowls were usually left undecorated, although not infrequently a circular design was painted on the bottoms of bowls.

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[95] Reichard, 1936, pp. 178–180.

Designs seem never to have been used more than once without some slight alteration of detail (32, 192). When a potter begins to paint her vessels, she has planned her designs only in the most general sort of a way. As informant 32 stated it: "I make them up as I go along." Furthermore, no measuring was ever done to assure an even spacing of the design elements around the body of the vessel (36, 192). Informant 32 further stated, "We always had crooked designs on our pots."

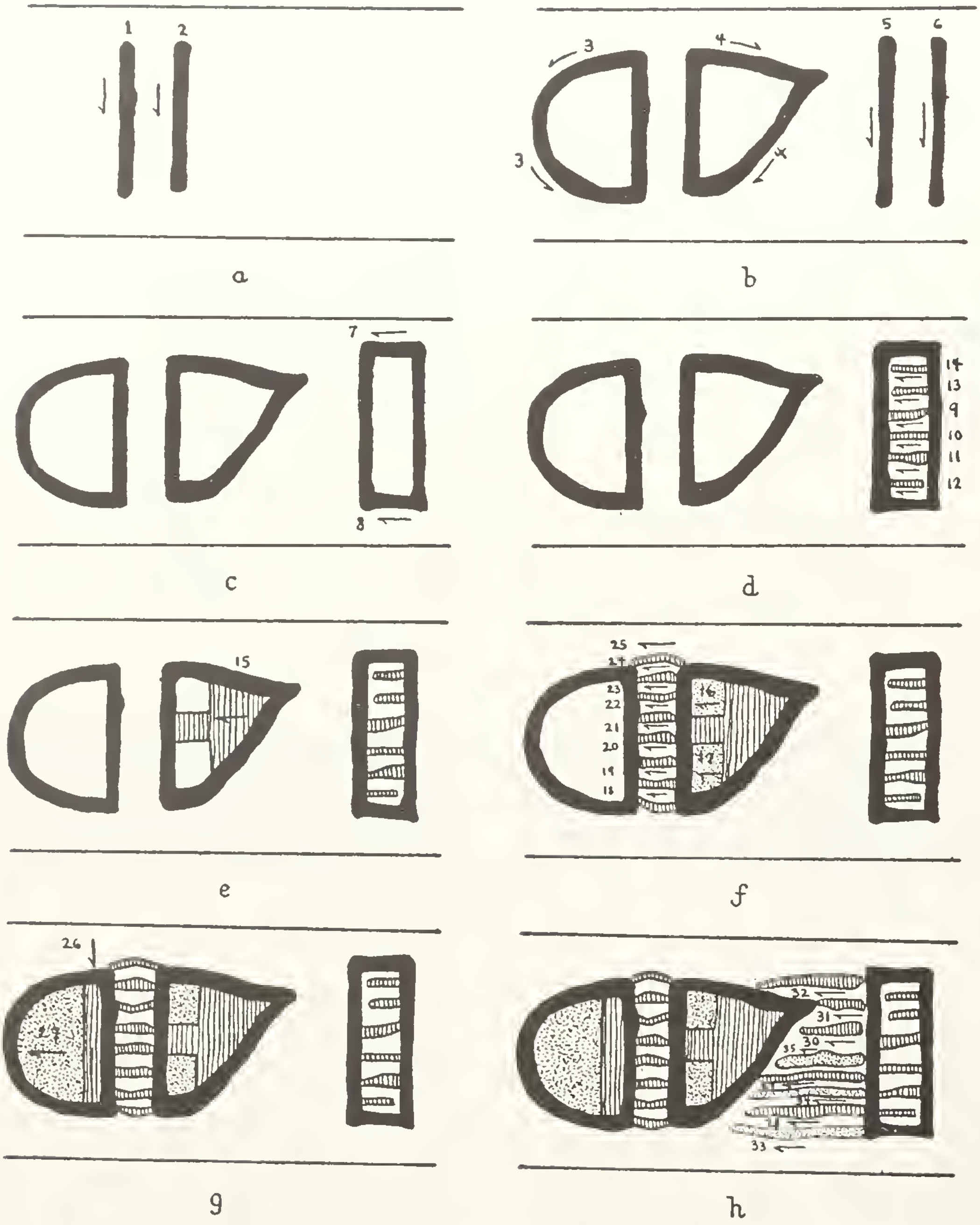

Fig. 6. Development of a design by 32.

Execution of Designs

Fig. 6 illustrates the step by step development of a bowl design by informant 32. As soon as the vessel had been slipped white and allowed to stand until quite dry, the potter began the painting. Supporting the bowl in the hollow of her left hand, she dipped her right index finger into the container of red paint and smeared it around the lip of the rim. As soon as this had been done, she inverted the vessel over the fingers of her left hand and, with the paint brush held in her right, drew a circle in black on the bottom of the vessel. She then filled in the circular area with black paint, applying it with her finger as described above. As soon as this area had dried, she took up the paint brush again and drew a red line around the immediate edge of the black circle. This line was begun at the far edge of the circle away from herself, and was carried around in a counter-clockwise direction until half of the circumference had been outlined in red. Then, returning to the original point on the far edge of the circle, the remainder of the circumference was drawn in a clockwise direction.

The paint dried almost as soon as it was applied to the surface of the vessel. As soon as she had finished painting the circular red line on the bottom of the bowl, she brushed off the loose particles of paint with her right hand and the paint did not smear. Her grandson (24) was constantly present as the painting proceeded, since he was needed continually to add fresh yucca juice to the paints. Several times during the course of the painting the supply of paint became exhausted and was replenished by him.

Then the potter placed the bowl so that it rested on its rim, supporting the vessel with her left hand. Holding the paint brush in her right hand, she drew two vertical lines in black on the shoulder of the bowl (fig. 6, a). She then completed the outline of these two "D-shaped" blocks by adding a pair of curved lines (fig. 6, b). Then, on the far side of these two elements, she drew a second pair of vertical lines (fig. 6, b). She intended to duplicate the first two blocks by finishing these in a similar manner. Since, however, she found that she had drawn them too close to the first design elements, she finished them by adding two short horizontal lines (fig. 6, c). In a similar manner she outlined the other design elements in black, paying no attention whatever to the symmetry of the whole.[96]

As soon as the design around the shoulder of the bowl had been blocked out in black, she began to fill in the various color areas with red and yellow paint. Beginning with a small, vertical rectangular element, she filled it in with short, heavy hatchings in red (fig. 6, d). Proceeding as illustrated in fig. 6, she slowly completed the painting of the design. No attempt whatever was made to keep the design elements symmetrical, and in some cases the two sides of a single element were deliberately painted differently (fig. 6, g). As the potter stated, she made up the design as she went along. Every now and then she held the vessel at arm's length and turned it around slowly. The painting was done first with one color and then with another until a satisfactory effect had been achieved.

Painting in this manner, some fifty minutes were required to decorate a small bowl (pl. VIII, c). In the case of a second bowl, the decoration on which was much simpler, the painting occupied the potter for only ten minutes (pl. VIII, b).

Informants agreed that vessels were not polished after the execution of the painted designs had been completed (15, 32, 192).

FIRING

The firing of the vessels constitutes the final phase of pottery manufacture. Although the techniques employed in regard to the cooking and painted wares seem to be basically different, the firing operation as a whole may be divided for descriptive purposes, into four stages: preparation, building the oven, burning, and post-firing treatment. As has been pointed out previously, painted vessels are burned in a fire of sheep manure, whereas cooking vessels are fired with wood.[97]

Preparation

In the case of informant 32, the firing of the painted bowls was done some forty feet to the south of the hogan in which the pottery was made. A level space, free from vegetation, was selected, and on this spot the potter's son (24) built the preliminary fire. Several handfuls of dry piñon needles were placed on the ground to serve as tinder, and over these dry piñon and juniper sticks were leaned together in a "tipi" formation.

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[96] It is interesting to note here that the "snowshoe" shaped element (pl. VIII, c) drawn by informant 32 on a bowl is also to be found as a motif on the vessel illustrated in pl. IX, b. The latter vessel, found in a cache, was in the possession of informant 192.

[97] The Franciscan Fathers imply that the firing of all vessels in the central area was done with sheep manure as the fuel (1910, p. 289). Gifford's informants stated that sheep manure was employed in the western area, while wood (preferably oak) was used in the east. James describes for the eastern area the firing of cooking vessels in a piñon wood fire (1937, p. 85). Sapir quotes Sandoval as stating that some women in the central area fired cooking vessels with sheep manure (1930, p. 576). Hill states that in the western area, cooking vessels were fired in a pit, preferably with juniper wood fuel; in the central and eastern areas, these vessels were fired on the surface of the ground, again preferably with juniper wood. He states further that in the west, slipped bowls and trays were fired in the same manner as were the cooking vessels. In the central area, painted bowls were inverted over stones and covered with sheep manure. In the east, these vessels were placed inverted on stones within a ring of stones; this circle was then filled with manure (1937, pp. 16–18).

As this fire dried out the ground, the potter's grandson went into the hogan to bring out the vessels, while the potter found several large sandstone cobbles. When the preliminary fire had practically burned out, the potter took up a stick and spread the coals around in a circle. Into this bed of embers the four stones were arranged, and onto these the bowls were placed in an inverted position so that they did not rest on the ground (pl. VI, a). No attempt was made to prevent them from touching one another, and several vessels were usually burned at one time. The small cooking pot was simply placed on its side in the coals alongside of the inverted bowls (pl. VI, a).

According to informant 192, painted vessels are fired in a circle of stones, although the pots themselves rest on lumps of charcoal. "If rocks touch the pots when they bake, they will split." Both 32 and 192 stated that the preliminary fire is often dispensed with if only cooking vessels are being fired.

Building the Oven

Next the dried slabs of sheep manure were brought from the nearby corral and piled in a heap beside the ashes of the preliminary fire. Taking them up one at a time, the potter (32) laid them horizontally in a circle around the elevated vessels (pl. VI, b). No fuel, however, was actually placed beneath the pots. As the potter continued to pile up the slabs of manure, each succeeding course extended farther in towards the center of the circle, in the manner of a corbelled dome of coursed masonry. When a dome approximation had been built over the vessels, the remaining space on top was bridged by two large slabs of manure. Although the potter was careful to see that the manure did not come into direct contact with the vessels, no props were used to prevent this. No attempt was made to chink in the intervening spaces between the slabs of manure with additional lumps of fuel.[98]

Around the base of the oven, branches and sticks were stacked lengthwise to form a circle. Dry piñon needles were placed underneath these to serve as tinder, and the fire was lighted (pl. VI, e). "I fire the pot" (literally), *ʔásaˑʔ biniˑ yédidísžeˑh.*

One informant (36) employed a simpler method in firing her pottery. Small dried chunks of sheep manure were heaped into a pile and ignited. When the fire had gotten under way, a depression was made in the center of the burning fuel with a wooden poker, and the vessels were deposited within it. Then the embers and blowing coals were heaped around the vessels, and they were allowed to remain in the oven for several hours.[99]

In the opinion of informant 192, cooking vessels can be burned in any kind of a fire, although wood is usually used for this purpose. These vessels, she stated, are not fired in pits. They are placed on their sides in the coals, and embers are heaped over them. According to 15, a small pit about six inches deep is dug, and then filled with live coals. Then the cooking pot is made to stand upright in this pit, and additional embers are heaped around the sides of the vessel. Finally the pot is covered first with green piñon branches and then with a layer of earth.

Burning

During the burning, the manure gives off a great deal of heat, but relatively little smoke (pl. VI, d). A quantity of smoke, however, is not regarded as a bad sign. "No matter how much the fire smokes, it does not hurt the pottery" (32). She believes that fire-clouding is caused by the burning manure when it comes into contact with the vessels, and this interpretation is probably correct.[100]

During the firing, little note is taken of climatic conditions. After the vessels have dried thoroughly, they are no longer in danger from the wind (32). No attention whatever is paid to the position of the sun, and firing may take place either in the morning or in the afternoon (15, 32,

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[98] The "masonry" type manure oven seems to be non-typical of Navaho pottery manufacture. The occurrence of this type of oven in the Ramah area may be due to the proximity of Zuñi pueblo, where this method of burning is characteristic. See Stevenson, 1904, p. 376.

[99] This woman admitted that sheep manure is not ordinarily used as a fuel for firing cooking vessels.

[100] Guthe points this out, suggesting that the moisture in the manure brings about a deposition of carbon on the surface of the vessel (1925, p. 76).

192). Even light rains are thought not to harm the vessels while they are burning (32).

The potter does not determine the condition of the vessels being burned in the oven by means of their color (32, 192). Although the pots are considered done when the kiln has burned out, informant 32, claimed that she can tell the condition of the vessels inside by the color of the ashes resulting from the burning manure. "If the pots are done, the ashes will be white."

The time required for the vessels to burn properly varies considerably in the opinion of different potters. One potter (32) allowed her vessels to burn for an hour and twenty minutes, while another (14) permitted hers to remain in the oven but forty minutes. A third woman (15) maintained that the vessels should burn for an hour and a half.[101] When the potter (32) felt that the burning had been completed, the oven was taken apart. Using a shovel, the ashes were raked away from over the vessels, and these were then removed immediately by means of a long stick of fire wood (pl. VII, a). The painted vessels were deposited on the ground near the remains of the oven and allowed to cool while the potter turned her attention toward the gumming of the cooking pots.

Color changes in both paints and paste are quite noticeable after firing (32). The paste composed of Zuñi clay is a light gray-brown in the dried and unfired condition, but turns during the burning to a light reddish-brown. The only pigment that retained its original color after firing was that used to produce the white slip.[102] The yellow paint changed from a mustard yellow before firing to a dull brick-red after. The red paint, a dark reddish-brown before burning, became after firing a shade more brown than terra cotta. The most drastic change, however, occurred in the case of the black paint. Upon firing, this pigment should have "stayed black" (32). Since, however, the pots observed during their burning were badly over-fired, the carbonaceous materials burned out completely, leaving as a residue a light, cream-colored ash.[103] The potter (32) remarked that "there must have been water in the paint." Cooling produced no further color changes.[104]

Bucchero ware is not manufactured (15, 32, 192). The matte black of many cooking pots is caused by the addition of piñon gum to the vessel's surface. When the pot is later employed for cooking purposes, the gum carbonizes on the exterior.

Accidents

The most common form of accident which may occur during the firing results from the careless handling of the vessels at this time. Those mishaps take the form of "fire-clouds", irregular, dark blotches on the exterior surface of the vessels. As previously stated, these are caused by the damp manure coming into direct contact with the vessels while they are being burned. This type of blemish was found to occur on a great many painted Navaho vessels in museum collections, and seems to be the rule rather than the exception. In the case of the painted bowls made by informant 14, the fire-clouding was so extensive as to completely obliterate the original color, and all potters admitted that such blemishes were by no means unusual.

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[101] Hill states that cooking vessels were burned from four hours to seven in the west; in the central and eastern areas, the pots were fired for six hours. The time required for the firing of slipped or painted wares seems to have occupied as much, if not more, time (1937, pp. 16–18). It is difficult to account for these discrepancies in the length of time required for the firing.

[102] In connection with these observations of color changes produced by firing, the results of Dr. Colton's experiments regarding prehistoric Southwestern firing conditions are very illuminating indeed. In his conclusions he states (p. 231), "if the pottery is buff, yellow, red or brown it was fired in an oxidizing atmosphere." As noted above, these were the colors produced by firing painted Navaho vessels with sheep manure. Colton states further that (p. 230) an exception to the above rule is formed by certain white clays and slips "free or nearly free of iron." The only Navaho pigment that did not change in color was that used for the white slip; and this pigment was a rhyolitic tuff, a substance almost lacking in iron content. Experimentation revealed (p. 231) that sheep manure produces an excellent oxidizing atmosphere. To quote Colton once again (p. 231): "if the pottery is white, gray or dark gray it was fired in a reducing atmosphere." Experimentation revealed (p. 230) that this condition could be produced by burning vessels with juniper wood fuel, where the reducing atmosphere is effected by the eventual burying of the vessels in a bed of charcoal which cut off the oxygen supply (1939, pp. 230–231).

The implications of the foregoing are important to the case at hand. Navaho cooking vessels, gray to blackish in color, are fired in a juniper wood fire, the charcoal from which produces a reducing atmosphere. On the other hand, painted Navaho vessels, which range in color from buff through red to brown, are fired in sheep manure which produces an oxidizing atmosphere. Here, then, is another indication of the basic dichotomy which seems characteristic of Navaho ceramics.

[103] Guthe notes that at San Ildefonso pueblo over-firing causes the black paint (guaco) to become much lighter in color: "in a bad case, the guaco will turn nearly white" (1925, p. 77). Similarly, Shepard states in regard to pottery pigments of organic derivation: " . . . these paints can be burned out with prolonged heating under oxidizing conditions." Kidder and Shepard, 1936, p. 415.

[104] Hill states the following in connection with slipped or painted ware: "In all areas the bowls or trays after firing ranged from yellow to brick red or red orange, or in the central and eastern regions, where the clay slip was used, from light to dark gray" (1937, p. 18).

Another not uncommon accident seems to result from a lack of proper control during the firing. Insufficient burning produces a discolored and friable paste, which, seen in cross-section, is banded down the center by a darker, under-fired zone (14, 32, 36). Over-firing results in a general discoloration of the pigments, which may be very slight or extreme, as in the case of the painted bowls made by informant 32. This defect was extremely noticeable, as previously stated, in the case of the black paint.

Still another type of accident which may occur during the firing seems to result from the faulty construction of the vessel itself. Two bowls made by informant 14 cracked to pieces in the oven. In both vessels, the entire bases broke off at the point where the angulation of the sides was most pronounced. Guthe attributes this type of mishap to extraneous inclusions and air bubbles in the paste which tend to alter the rate of expansion of the various parts of the vessels when the latter are subjected to heat.[105]

Spalling was not noticed in the case of the vessels observed during their firing, but was found to occur on several Navaho vessels in museum collections.

Post-Firing Treatment

After they have been removed from the oven and wiped with a dry cloth, the painted vessels receive no further treatment. According to informants 32 and 192, painted vessels are never greased with sheep fat, nor are they smeared with piñon gum. Informant 36, on the other hand, used to paint her vessels after they had been fired. Before they were slipped, she rubbed a little sheep fat on them "to make them shiny."[106]

The cooking vessels, on the other hand, are now ready to receive their coating of piñon gum.[107] While still red hot, they are removed from the fire by means of a poker and placed on a nest of green weeds in the manner which has been described.

Holding up the mouth of the vessel at an angle with a short stick, the potter (32) dropped several small lumps of piñon gum inside. The heat of the vessel melted this almost immediately. Taking up the brush of green piñon needles, the potter swabbed the gum around vigorously inside in order that it might cover every inch of the interior (pl. VII, b). At one point the molten and highly inflammable gum burst into flames, and the fire was allowed to burn out of its own accord. Adding a few more lumps of gum, the swabbing continued until the inside was thoroughly coated. Then, taking up a small stick, she placed it inside the vessel so that she could turn it over. In her right hand she held a large lump of the gum which she had taken from the supply in the pail beside her, and applied it directly to the exterior surface of the vessel (pl. VII, d). Contact with the heated walls melted the gum sufficiently so that it would flow, and it was then spread over the surface with the brush.[108] Finally, she took up a handful of green weeds and wiped the vessel off with these. The whole operation had occupied a period of twenty minutes.[109]

After the coating of gum had been applied, the interior and exterior of the vessel was greased with sheep fat in order to prevent the gum inside from sticking to the food when the vessel was employed for cooking purposes. Informant 32 asserted that "when you cook in one of these pots, the gum on the outside does not catch fire," but this seems unlikely.

In applying piñon gum to her vessels, informant 36 followed a different technique just as she had previously done in the actual firing. After she had allowed the vessel to remain in the heap of burning manure for some time, she dropped several lumps of piñon gum into it. As the gum melted, she stirred it around inside with a green stick. Then, holding the red hot vessel between two sticks, she dipped piñon gum out of the pot with a brush of green piñon needles and coated the exterior of the vessel with it. After the vessel had been thoroughly coated inside and out with gum, it was placed back in the fire and worked around until all of the gum had burned off. When this was done, the vessel was considered completed. She claims that "the gum is put on to make the pot hard." When the vessel had almost cooled, it was rubbed inside and out with sheep fat, *dibé bak̓ah*, to make it smooth and shiny (15, 32, 192).[110]

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[105] Guthe, 1925, p. 76.

[106] Hill states that in the central area bowls and trays were rubbed after firing with a mixture of tallow and sheep brains in order to harden and polish them (1937, p. 18).

[107] "I gum the pot," *ʔása·ʔ yĭšžę·h.*

[108] Informant 15 was in agreement with the above description save for the fact that hot pebbles were placed inside the vessel along with the piñon gum in order to insure that the latter remains in a molten condition.

[109] Hill states: "Before the pots became cold they were removed from the firebed with a stick, placed on pinyon boughs or some flat surface, and rubbed inside and out with pinyon pitch. The pitch was applied with a stick, pinyon branch, or a rag" (1937, p. 17). The Franciscan Fathers assert that the cooking vessels were smeared with piñon pitch before firing (1910, p. 289). James states that the pitch was applied after firing with a piece of sheep skin, hair inside (1937, p. 85).

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[110] Hill states (1937, p. 17): "In the central area, after pitching, the pots were thoroughly greased with mutton tallow to remove the taste of the pitch."

PART II

SOCIAL AND RITUAL ASPECTS OF POTTERY MAKING

PART II. SOCIAL AND RITUAL ASPECTS OF POTTERY MAKING

PARTICIPATION IN POTTERY MAKING

IN keeping with aboriginal North America generally, pottery manufacture among the Ramah Navaho was, with the exception of pipes, an occupation almost exclusively confined to the women. The transvestite formed an exception to this rule, since, according to Hill, the activities of these individuals largely overlapped those of both men and women. In addition, they were considered especially talented in respect to the arts and crafts: "they knit, tan hides, make moccasins, are said to be excellent sheep raisers, and excel as weavers, potters and basket makers."[1] A transvestite who lives near Crown Point is said to be one of the few remaining Navaho potters on the reservation.[2] There are, however, no potters in the Ramah group who fall into this category.

Formerly men, lest they become impotent, did not make pottery, although they assisted the women at various points during its manufacture (15, 32, 192).[3] There are, however, several cases in which men assisted in pottery making. Informant 39 ground the clay and temper for his mother (32) while 24 assisted his mother-in-law (32) with the preparation of the paints.[4] Again, 24 constructed the oven under his mother-in-law's direction, and removed the vessels when the firing had been completed.

Children, as stated previously, assist the women in collecting the raw materials. Helping in this capacity was especially the function of young girls who were learning the craft (15, 32, 192).

It is difficult at the present time to obtain reliable statistics indicative of the number of individuals participating in pottery making during the formative period of the Ramah community. Figures gathered, however, during the course of a hogan to hogan survey suggest that the number of Navaho women who formerly made pottery was somewhat greater than the existing literature would indicate. This, obviously, does not apply to present conditions, since no vessels are actually manufactured today. For purposes here, a woman has been classed as a potter if, at some time during her lifetime, she was actively engaged in the pursuit of the craft.

Of some one hundred and sixteen females in generation I, none make pottery, while but one of the sixty-nine women in generation II is familiar with the techniques of the craft.[5] This woman (36), who makes both painted and cooking wares, lives only a part of the time in the Ramah area, since her principal ties are with the Two Wells group. Of twenty-six women in generation III (two of whom are now dead), six were potters. But two of these women manufactured painted wares, while the other four made only cooking vessels. Whereas the data relating to generation IV are admittedly inadequate and of but slight reliability, there is a record of some eight potters, only three of whom were said to have made painted pottery.

It is important to enumerate the localities from whence came the teachers of the present pottery making inhabitants. In the cases recorded, these individuals were not removed in point of time from the informants, their descendants, by more than two ascending generations. For convenience in reference, the original homes of these women may be given in terms of the informants: Tohachi (14); from a place five or six miles northwest of Gallup in post-captivity times, but originally from the San Juan country (32); from the same place northwest of Gallup (192); from Toadlena in post-captivity times, but originally from the San Juan country (15); from the Two Wells-Danoff area (36).

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[1] Hill, 1935, p. 275.

[2] James, 1937, p. 85.

[3] Due, presumably, to the deterioration of pottery making as a craft, the attitude of the men in this regard seems to have been modified. Informant 39 stated, "I could make a pot if I had the right clay." He had, in fact, never made one, although he had helped his mother, 32. Informant 40 made a small vessel to sell to the writer, although he had never made one before, and had not seen pottery being made since his mother died some ten years ago.

[4] When it was pointed out to the old woman that her son-in-law should not be present, she replied. "They always told me that I would go blind if I looked at my son-in-law, but I'm blind anyway."

[5] The census data, in terms of generations, were supplied by Dr. Kluckhohn, Generation I includes all individuals who have never been married. Generation II includes all individuals who are, or have been married, but who do not have married children. Generation III includes all individuals having married children, while generation IV includes the few individuals who have married grandchildren. Account has been taken here of unusual cases, such as women who belong logically to generation III, but who have never had any children.

From the foregoing it is clear, then, that the ceramic tradition of the Ramah Navaho potters has its roots in the eastern area and the eastern periphery of the central area. This fact may account in large part for the heterogeneity of pottery making techniques which seems to have prevailed among the Ramah Navaho.

LEARNING AND TEACHING

A girl began to learn to make pottery some time between the ages of eleven and fifteen.[6] Whereas in each case the girl had actually reached the age of puberty before acquiring the ability to make pottery, informants stated that there were no restrictions against learning before that time (15, 32, 192).

The teacher-learner relationship seems to have been a rather informal one, the basis of which appears to have been primarily blood kinship. In five cases, the girl learned to make pottery from her maternal grandmother (or her sisters).[7] In a single case, that of the maternal grandmother of 36, the girl learned from her actual mother. This instance, furthermore, is subject to some doubt since the individuals involved were the informant's grandmother and great-grandmother. In five cases, the mother of the girl did not make pottery at all, whereas in two cases the mother made pottery also.

It obviously would be unwise to draw sweeping conclusions from the data at hand. There are, however, in the learning-teaching relationships involved in both pottery and basketry[8] manufacture, some indications that young girls tend to learn the crafts rather from the maternal grandmother (or her sisters) than from the mother. Dr. Kluckhohn informs me that it is his observation that the bonds of relationship between maternal grandmother and grandaughter are apt to be extremely close. On the other hand, it has been pointed out above that in several instances the mothers did not manufacture pottery at all. It is difficult to interpret this situation in view of the obsolescent nature of the craft under consideration, and it seems not unlikely that the picture has been somewhat warped because of this factor. Whether or not the maternal grandmother-granddaughter relationship rests primarily upon clan affiliation or upon actual blood kinship, it is impossible to determine from the data. However, it has been pointed out elsewhere in respect to the learning of song ceremonials that "there is little evidence that clan, as such, is a factor of importance in the initiation of the teacher-learner relationship."[9]

The initiative in the establishment of the teacher-learner relationship might be taken by either of the individuals involved. A young girl might aid her grandmother in the collection and preparation of the raw materials, in this way gradually absorbing the details of pottery manufacture (14 and 36).[10] In other cases, the training assumed a more formal aspect, as illustrated by the following accounts of informants 32, 15, and 192.

> I learned to make pottery over on the other side of Gallup at a place called *ba·hasƛ̓a*. My maternal grandmother told me that it would be a good way to make money to buy my things with.[11] She sat with me and helped

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[6] Informant 15 learned at eleven or twelve years of age; 36 at eleven or twelve; 14 at twelve to fourteen; 32 and 192 at fifteen.

[7] Informant 14 (clan 37) learned pottery making from her maternal grandmother. The mother of 14 did not make pottery. Informant 32 (clan 35) learned also from her maternal grandmother. This woman had four sisters, all of whom made pottery; the mother of 32, however, did not make pottery. Informant 15 (clan 18) learned from her mother's mother's sister. A parallel cousin (mother's sister's daughter) of 15 learned from her own maternal grandmother. In these two cases, neither of the mothers made pottery. Informant 36 (clan 36) learned from her maternal grandmother. This woman learned from her own mother, whereas the mother of 36 did not make pottery. Informant 192 (clan 35) learned from a woman whom she called "maternal grandmother." Since, however, this woman belonged to clan 25, which precludes actual blood relationship through the mother, it seems likely that "maternal grandmother" is used in this instance simply as a term of respect. Informant 169 (clan 37) learned to make pottery from her mother.

[8] Tschopik, 1940.

[9] Kluckhohn, 1939, p. 65.

[10] Hill states: "The knowledge of the art was acquired early in life. Children of five or six were told to watch their mothers and grandmothers as they worked, and were given lumps of clay with which to imitate the actions of their elders. As they grew older they made small pots under supervision and were corrected when they made errors" (1937, p. 11).

[11] The extent to which trade in pottery was formerly carried on is difficult to determine at present. Informant 15 recalled these prices received for pottery: a big sheep and a lamb for a small cooking pot; a second-hand pendleton blanket for a medium sized cooking pot.

> me until I learned how. At first I started with a little painted bowl, because this is the easiest kind of a pot to make. I had a hard time learning because my first ones used to split all the time before they were ready to bake. My first pot wasn't very good; it took me about a year to learn (32).

Another informant related:

> At the time when I learned to make pottery, I was herding sheep for my maternal grandmother over at Piñon Springs below Two Wells. One day I came back toward the hogan and saw a woman named *ˀaxá·nába·ˀ* grinding something—this was clay. Soon this woman began to stir up the paste. My grandmother told me that I could sit around and watch so that I might learn how to do it. I saw everything. The reason they were making the pottery away from the hogan and not right in it was so that they could be away from the singers and the people who had been sung over many times. This was the first time I ever saw anyone making pottery. Sometimes I used to make little pots for the fun of it. After that I used to help my grandmother grind up the clay and mix the paste. She would call me over to where she was working and give me a little dish. Then she showed me how to mix the clay with water and how to stir it. She told me that the paste was done when you could see the temper in it. I never got the job done like my grandmother wanted me to do it—so she had to help me. She made fun of my first pots and said that I did a poor job of it. The bottom of my first pot was wrong, and it wouldn't stand up straight. At this time I started making pottery (15).

A third informant related:

> When I learned how to make pottery, I lived at a place called *ba·hasƛ̓a* northwest of Gallup. At this place there were quite a few women who made pottery. I learned from a big, tall woman named Mexican's Wife—she was one of the Mexican People. She used to show me how to do everything about pottery, but it took me almost a year to learn. My first pot was not very good. The second one was better. They went better each time (192).

All informants agreed that the girls did not pay their teachers a fee in return for being taught to make pottery (15, 32, 36, 192). "I did not pay anything to learn how to make pottery, but I gave my grandmother pots whenever she wanted them" (32).

The making of pottery in the "old days" afforded an opportunity for the women to come together, and doubtless, to exchange gossip. Several women used to work together in a hogan away from everyone else. Such groups were usually composed of the young potter, her teacher, and various friends who also made pottery (15, 32). According to informant 32, these groups were not necessarily made up of the members of a single clan. As a matter of convenience and speed in working, the work was divided among the various women present (15, 32). One potter would make painted bowls, another large cooking vessels, still another would make small unpainted pots. This division of labor prevailed especially before an Enemy Way or a nine night ceremonial, in which a number of vessels would be required both for cooking purposes and for drums (32, 192). Rigid specialization, however, as regards the type of vessels manufactured did not occur; a woman might make either painted or cooking ware, or both (15, 32, 192).

THE DECLINE OF POTTERY MAKING

Since the close of the captivity period at Fort Sumner, pottery manufacture among the Ramah Navaho has been steadily on the decline, until today the craft has become, for all intents and purposes, obsolete. The fact of this obsolescence is brought out clearly by the census figures presented above; there remains but to inquire briefly into the factors which have contributed to the decline of this craft.[12]

Writing of the Navaho in 1893, Stephen observed: "The older woman still make cooking utensils of pottery, but the younger women no longer practice the art. The iron camp kettles and tin cups and coffee pots brought in by the trader are rapidly displacing the primitive gourd ladles and earthen jars."[13] This factor, the replacement of native vessels by utensils of our culture, is recognized clearly by the Navaho themselves. According to informant 15, "there are too many dishes and cups around—you can buy them at the trading post." Similarly, "All the old people have stopped making pottery—I think this is because there are lots of dishes" (32). In a like manner, 192 asserted: "I stopped making pottery over twenty years ago. I stopped because there were too many tin dishes to eat out of. This is why the young girls didn't like to make pottery."

Another factor, which has been discussed elsewhere,[14] is the relationship of ritual restrictions and related magico-religious phenomena to the decline of the craft. The significance of this factor, which must not be overlooked, will be treated in terms of cases in the following section.

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[12] The writer has presented similar census figures for the basketry craft elsewhere. Tschopik, 1940.

[13] Stephen, 1893, p. 358.

[14] Tschopik, 1938, pp. 257–262.

In view, therefore, of the obsolescent nature of pottery in the Ramah area, the attitudes of informants toward the decline of the craft are interesting. On the part of the older women there is a desire to teach the young girls to make pottery, and, coupled with this, is regret that the craft is dying out. Speaking of her young granddaughter, informant 32 complained:

> I think this girl should learn how to make pottery, but when I say I want to teach her, she just laughs and makes fun. She says that there are too many dishes already made—all the young people are like this. It will be too bad for the young people when they forget all these things.

Similarly, informant 15 stated:

> I am willing to teach my granddaughters how to make pottery. I believe they would like it. I cannot understand why more women do not make pottery today—it is too bad. When there was an Enemy Way in the old days, people did not have to rush around to find a pottery cup for the medicine and a cooking pot for the drum like they do today.

RITUAL RESTRICTIONS

One of the most remarkable features in connection with Navaho pottery is the number of ritual restrictions which accompany and surround every phase of its manufacture. But although in the main this generalization seems warranted, certain important qualifications must be made at the end of this section.[15]

All potters agreed that the pottery should be made in a hogan away from other people, where no one might watch (14, 15, 32, 36, 192).[16] Informant 15 maintained that it was all right for a person to observe the grinding of the clay, but not the actual construction of the vessels: "for every person who watches, the pot splits. If someone watches on the right side, the pot will split on the right side. If anyone picks it up before it has been baked, it will split all over." She stated further that her grandmother used to cover up the pottery whenever anyone came around. "If anyone looks when pottery is being made, it is just like lightning striking a tree" (15). Similarly, 32 asserted: "When you are working on pottery, you must always work away from the other people. You must stay away until the pots are all finished and baked."[17] According to informant 15, if someone comes in while pottery is being manufactured, the potter should rub some of the clay on the visitor's face. This was not done according to the order of painting followed in song ceremonials (15, 32).[18] Informant 192 was not familiar with this practice.

During the actual course of construction, many ritual restrictions were observed. One should not molest snakes, frogs, or dogs (15). One must not break the metate on which the clay is ground, nor may one step over the paraphernalia and clays used in pottery making (15, 32). No one may touch the pottery with bloody hands (15, 32, 192). Should the potter break an animal bone, her own bones would be injured (15). One should not hit another person or swear (15, 32, 192). No potter, while actively engaged in pottery making, should jump across deep ditches (15). Should it be raining, one may not enter a hole in the ground, nor get under a rock or a tree; one must not run, but walk. "If you do these things, you may get struck by lightning" (15). While making pottery, one should neither laugh nor talk in a loud voice (15, 192). The practice of leaving an opening in pottery designs has been discussed previously.[19] Informant 15 stated that, whereas her teacher used to sprinkle corn pollen into the water when mixing the paste, she had never followed this practice herself. Informants were in agreement that a woman should not work on pottery while she is menstruating (15, 32, 192). Similarly, in event of a death, a woman may not work on pottery for four days and nights (12, 15, 32). According to 15, 32, and 192, one should think about making good pottery while constructing the vessels.[20]

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[15] As complete an inventory of ritual restrictions as could be obtained was collected from each of three potters: 15, 32, 192. In the opinion of the writer, each woman was equally well qualified to act as informant on this subject. Since these women were widely separated geographically, there is little reason to believe that the statement of one influenced the accounts of the other two.

[16] Whereas general agreement prevailed that no outsider should watch pottery manufacture, the presence of the writer was permitted since he was a white man; hence the restrictions did not apply to him (15, 32).

[17] This practice has been noted elsewhere. "Throughout the whole area, it was thought that the potter would have better luck if she worked unobserved. If visitors were seen approaching, the pottery was covered until they departed." Hill, 1937, p. 21. Sandoval states, ". . . not everybody can go into where you are making pots because it is bad luck, that is, you are bound to have bad luck if you allow everyone to come and watch you." Sapir and Sandoval, 1930. The Franciscans also have noted this restriction (1910, p. 228).

[18] Hill states that if a visitor arrived before a potter had a chance to cover up her work, clay was rubbed on the newcomer's face and arms. He adds that in the east this practice was elaborated, the potter following the prescribed chant pattern (1937, p. 21).

[19] References to this observance have been made by Hill, 1937, pp. 16, 18; Franciscan Fathers, 1910, p. 286.

Firing was considered an especially critical stage, and the vessels were thought to crack should anyone watch the proceedings.[21] Informant 32 was much concerned when her husband, 3, appeared on the scene during the burning of the vessels. She asserted that he was not supposed to witness the firing because, in addition to the fact that he had been sung over many times, he himself was a singer. Informant 15 stated that while her teacher used to sprinkle corn pollen on her vessels before the firing, she herself had never done this.[22]

On the day that the vessels have been finished, the potter must be especially careful of individuals who have had many song ceremonials. According to 32, "when you bring the pottery over to the other hogan, you must be careful of the people who have been sung over. When you come near to the people who have been sung over, you say, 'Look away, I have pottery.' They look away and say, 'Let me feel it.' Then you hand them the pots and they feel them all over with their hands, looking away all the time. Then you say, 'Look with your eyes', and they look at it."

Song ceremonials are thought to damage one's ability as a potter. While 15 was working on a cooking pot, several large cracks appeared in the vessel. She stated that she believed this was due to the number of song ceremonials she had had. "You are not supposed to make pottery after a singer has sung over you. I believe that the marks the singer painted on me have something to do with these cracks."

Women who had had many song ceremonials were destined to failure at the outset. According to 36, "a woman who has been sung over many times can't make pottery; it will not turn out right. It is all right to make pottery if you have had only Blessing Way or Evil Way, but not if you have had the other sings." Chiricahua and Apache Wind Ways were thought to have especially bad influence on pottery making (15, 32, 192).[23] According to 14, only the Holy Way sings were harmful to pottery.[24] This woman related: "I stopped making pottery about twenty-five years ago. I did this because they sang Female Shooting Way, Holy Branch over me. This made the pottery break all the time, so I had to stop" (14).

Wind was thought to be especially apt to harm the vessels before they had been fired (15, 32, 192). Whereas pottery vessels were dried outside in the sun on good days, they were taken into the hogan should a wind come up (15, 32, 192). Again, while 15 was making pottery inside her hogan, great gusts or wind blew in through the door. Noting this, she stated, "The wind is angry with me. Thirty years ago I had Chiricahua Apache Wind Way sung over me for the first time. In a minute the pot will all split to pieces."

Pottery making, because of its exclusive association today with ceremonial practices, is believed by some women to be a potential source of illness. Informant 32 stated that several years ago she had trouble with her eyes and became partially blind. Upon performing divination by hand trembling, she discovered that this had happened because she had made pottery too often. A more elaborate case was related by 15. Some time ago she became sick when a whirlwind "ran over" her and threw her down the side of a hill. While she was sick she dreamed that "the old people" from the ruin in which she collected potsherds for temper were chasing her.[25] After she had done hand-trembling divination, she decided to have a Blackening, during the course of which the singer told her that she might continue to make pottery, but must never touch the potsherds again. Somewhat later she had Chiricahua Apache Wind Way, and was again told by another singer (1) that she should cease to use potsherd temper. "So I stopped making pottery, because I knew that the pots would split without the broken pottery" (15).

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[20] A statement to this effect was also made to Hill by one of his western informants (1937, p. 21).

[21] Hill records this belief (1937, pp. 21–22).

[22] This practice has been reported by Hill from the eastern area (1937, p. 21).

[23] "Anyone who has had a Wind Way can't be around or else the pottery will all split up." (192). "People who have had Apache and Navaho Wind Ways can't make pottery themselves and can't come around when you are making it" (15). Hill states, "Those people who had had the Wind or Shooting Chants were considered especially bad luck for potters" (1937, p. 21).

[24] Wyman and Kluckhohn have presented the Navaho classification of Holy Way ceremonials (1938, pp. 5–6).

[25] Here she alludes, presumably, to the spirits of the dead Pueblo Indians who are thought to inhabit these places. Dyk records an episode in which his informant, Son of Old Man Hat, became sick when he carried home a pot which he had found in a ruin (1938, pp. 63–65).

All informants agree that the usual misfortune which was apt to befall those who ignored the ritual restrictions was blindness (14, 15, 32, 192). "You usually get to be blind if you do wrong about pottery" (15).

From the foregoing, although the data are manifestly inadequate, three points are suggested. First, a rather large number of ritual restrictions were bound up with the manufacture of pottery. Second, specific restrictions varied from one potter to the next, although a few seem to have been observed by all. This is indicated further by the statement of 15. "Each woman who makes pottery goes by her own way and has different things that she can't do." Third, in a quantitative sense, the restrictions seem to have varied considerably from one individual to the next. Informant 15 observed all of the ritual restrictions attended by 32 and 192, and in addition abided by several others of which the latter two claimed ignorance. It is possible that the differences in the observation of ritual restrictions may be affected by the obsolescent nature of pottery making and by unequal factors in the learner-teacher relationships of the individuals here considered. It is also possible, however, that a residue of differences in this regard may be attributed to individual peculiarities of "temperament."

REFERENCES TO POTTERY IN MYTHOLOGY

There are various references in Navaho mythology to the origin of pottery and to its manufacture in the mythological past. Although the versions are often inconsistent, this situation, which seems not too uncommon among non-literate peoples, may possibly reflect in some measure the heterogeneous origin of Navaho pottery making.

According to a legend recorded by Matthews, the invention of pottery is attributed to the hermaphrodite twins born of First Man and First Woman.[26] The first offspring of this couple were a pair of hermaphrodite twins. Later, four pairs of normal twins were born, and these married Mirage People of the opposite sex.[27] Their numerous offspring married with the Pueblos and also with those who had come from the lower world. Soon there were many people in the land. The descendants of First Man and First Woman made a great farm, built a dam and dug a large irrigation ditch. Since they feared that the Pueblo Indians might injure their dam and crops, they placed one of the hermaphrodites to watch the dam and the other to watch the lower end of the field. The hermaphrodite who watched at the dam invented pottery. He first made a plate, a bowl and a dipper, which are said to have been greatly admired by the people.

A second version again attributes the invention of pottery to a hermaphrodite, but under different circumstances.[28]

> This was while Woman Chief's son-in-law[29] was sulking for four days after he had a fight with his mother-in-law. The people were worried about him because he used to tell them what to do every morning. So they got the hermaphrodite to see what he could do about it. They brought him to the boss and he asked the hermaphrodite if he could grind corn. He said yes. Then the boss asked him if he could make a hair-brush. He said yes. Then the boss asked him if he could make pottery (*ʔása·ʔ*). He said yes. Last the boss asked him if he could make a mush-stirrer, and he said yes again. This was when the men and women were separated on opposite sides of the river.[30]

According to informant 1, the making of pottery (as well as basketry) was begun after Gila Monster and Big Fly had left the early Navaho, and had given them the two lucky songs.[31]

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[26] Matthews, 1897, p. 70.

[27] For a detailed discussion of the status occupied by the hermaphrodite in Navaho culture, see Hill, 1935.

[28] This account was obtained from a Navaho, Tucson Samuels, whose affiliations are with the Two Wells group.

[29] By comparison with similar versions related by Goddard and by Matthews, this man seems to be identifiable with First Man. Goddard, 1933, pp. 12–15; 128–129. Matthews, 1897, pp. 71–72. In this same work, Matthews (p. 40) identifies Woman Chief as the "chief of witches."

[30] In the version related by Goddard, the hermaphrodite is questioned about two types of pottery vessels: a pot (*ʔása·ʔ*), and a plate (*le·c̓a·ʔ*) (1933, pp. 14–15). In addition a gourd cup is mentioned, but the text does not make it clear whether the reference is to an actual gourd or to its pottery counterpart. The same word is used in Navaho to designate both, but the word specifying a dipper of pottery is usually prefaced by *hašƛiš*, "mud."

In the version recounted by Matthews, both "cups" and "bowls" are mentioned. The event described, however, refers to a time after the initial invention of pottery by the hermaphrodite (1897, p. 72).

An unusual version is related by Schoolcraft.[32] After the sun, moon and the heavens had been created, the "old men" made two water jars. One "was most gorgeously painted on the outside, and very beautiful to the eye, but contained worthless trash; while the other was of plain brown earthenware and had no paint to render it beautiful, but contained flocks, herds, and other things of great value. Calling up the Navajoes and Pueblos, they gave the first choice (having the tops of the jars covered) to the Navajoes, who immediately seized upon the beautiful but worthless jar, while the other, so rich, fell to the lot of the Pueblos."[33]

Several references allude, not to the origin of pottery, but to its manufacture in the mythological past. Curtis records the following.[34] At the time when the earth was inhabited only by the Holy People, the lesser holy ones (the Fox, Badger, Wolf, and Bird People) worked much in clay. When these people continually employed designs which were taboo (to be used only in ceremonials) on their vessels, First Man and First Woman became angry. Calling a council, it was decided that the Wind People should destroy them.

Again, Goddard relates a curious legend concerning Pot Woman. This character was familiar with the art of pottery making, and is said to have dealt also in witchcraft.[35]

Aside from references to pottery in the Navaho origin legends, it is frequently mentioned in the legends and songs of the various song ceremonials, and is often depicted in the sand-paintings associated with these. Father Berard Haile, while relating a hogan song from a Blessing Way, states, "The song mentions a number of older cultural remnants, like the stirring sticks, earthen cooking pots, ladles and bowls, the metate and the broom, and the grass mats for sleeping."[36]

Again, references to "dark, blue, yellow and white water pots" are to be found in certain songs from Enemy Way.[37] In the origin legend of the same ceremonial, the Dawn Children are said to carry a "dawn ladle" and a "dawn bowl." It is interesting to note in this connection that the word which is used to specify "bowl" is *łe·ċa·ʔ*, which term today refers specifically to a painted bowl.[38] In Monster Way legend, the following account is given of the use of pottery by Monster Slayer during his stay among the Syphilis People: " . . . he produced a yellow earthen bowl which he had, and emptied some gray food (cornmeal) into it. From a water jug, strapped over his shoulders, he added water to it, and that alone he ate."[39]

In the sand-paintings which accompany the song ceremonials, various types of objects are represented, and among these pottery. According to Tozzer, one sand-painting from the Night Chant depicts the four rain deities. "From the left hand of each figure hangs a round water-bottle, the emblem of his office."[40] Several sand-paintings from the Shooting Chants depict pottery vessels. One illustrates the personified Earth and Sky.[41] At the widest part of the Earth, and in the center, is a black vessel with four rainbows. Various plants—corn, beans, squash, tobacco—are represented with their roots in the water. Another depicts the black Sky People, the blue Water People, the yellow Sun People, and the pink Summer People. When the painting is made, the Sky People lie in the east (female to the south, male to the north). "Each holds a black jar and a black talking prayer stick in the left hand, and in the right, five zigzag lightnings. The jar is black with border of white, yellow, blue and red." Similarly, the Water People hold blue jars, the Sun People yellow jars, and the Summer

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[31] This informant related the above fragment to Dr. Kluckhohn, but refused to disclose the rest on the ground that this matter should not be discussed during the summer months.

[32] Schoolcraft, 1854, p. 90.

[33] Mr. Richard Van Valkenburgh writes me that he has recorded a version of Bead Way in which the people of clan 17 are said to have brought pottery to the Navaho.

[34] Curtis, 1907, p. 95.

[35] Goddard, 1933, pp. 76–81, 158–159.

[36] Father Berard Haile, 1937, p. 7.

[37] Father Berard Haile, 1938, pp. 263–264. Here the word for "water pot" is *tóʔása·ʔ*. Since this, however, is the usual color-direction symbolism which occurs throughout Navaho ceremonial practice, it seems unlikely that this particular allusion refers specifically to vessels which were in fact painted. This is further borne out by the fact that informants (with one exception) denied that blue paint was ever applied to pottery vessels.

[38] Father Berard Haile, 1938, pp. 104–105.

[39] In this passage "yellow earthen bowl" is rendered *łe·ċałcóiye·*, while "water jug" is *tóʔása·ʔ*. Father Berard Haile, 1938, pp. 132–133.

[40] Tozzer, 1903, p. 325.

[41] Newcomb and Reichard, 1937, pp. 55–56. This sand-painting is illustrated on page 37.

People pink water jars. According to one of their informants, "Sky Man has a dark cloud in his jug, Sky Woman has dark mist, Water Man has male rain, Water Woman has vegetation. The Sun People have pollen of all vegetation, lacking none, and the Summer People have dew of all plants, none lacking."[42]

Locality is often symbolically represented in sandpaintings. On occasion actual pottery vessels may be used for this purpose. "A bowl may be buried in the sand at the center and filled with water, thus making the representation of water realistic."[43]

To summarize the foregoing, then, it may be stated that there is a tendency on the part of some Navaho to attribute the invention of pottery in mythology to a hermaphroditic character. At any rate, it is consistently referred to the pre-emergence period in Navaho legend.

With the possible exception of the pottery dipper, all other characteristic forms of Navaho pottery vessels—cooking pot, bowl, and water jug—are designated in myths and legends by the customary linguistic terms, and references are made to the every-day usages of these utensils. Taking into account the factor of the familiar color-direction symbolism, there remains a residue of references which seems to allude specifically to painted pottery.

One is reminded, in this connection, of Hill's statement, "One of the characteristics of Navaho culture is the unusual amount of ritual that has been integrated in the affairs of every-day life."[44] Conversely, therefore, it seems significant here that details of every-day life, such as the use of pottery vessels, have been incorporated into the body of Navaho ritual, of which legend may be said to constitute an integral part.

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[42] Newcomb and Reichard, 1937, pp. 59–60.

[43] Newcomb and Reichard, 1937, p. 70.

[44] And also, "So thoroughly have been the adjustments of the ritual and material sides of the culture that to the Navaho mind, they appear indistinguishable." Hill, 1938, p. 177.

PART III

PIPES

PART III. PIPES

WHEREAS few pipes are manufactured today by the Ramah Navaho, at least two interesting varieties of pottery pipes, *nátosce*, were formerly made: (1) a tubular type; (2) modified elbow form.[1] Actually, two sub-types of the tubular variety may be said to have existed. "One was straight like a cigarette, but thicker at one end and about three inches long" (pl. XVI, b); the other (pl. XVI, a) was of similar length, but "just a little bent" (12). The "straight tubular" form is considered female, the "bent tubular" type male. In the main, however, the term "tubular" is not strictly applicable, since a slight lip or bowl extends out from the thicker end of the body. These pipes would seem, in fact, to represent a sort of rough compromise between true tubular and elbow forms. In the case of the two elbow pipes (pl. XVI, c–d), the "male" pipe is differentiated from its "female" counterpart by color; the former is painted black while the latter is painted blue.

The ritual smoking of pipes seems to have been indulged in on at least two occasions: in ritual hunting and again in curing ceremonials.[2] With the exception of certain qualifications which must be made below, there seems to have been no sharp segregation of pipes for use in ritual hunting on the one hand and in curing ceremonials on the other. This fact seems to be indicated in several ways. First, informants 1 and 12 learned to manufacture pipes from the same individual, although 1 used his pipes in Talking God Blessing Way, whereas 12 employed his in hunting.[3] Again, certain hunting pipes were used in addition, according to 12, in Game Way Blessing Way and also in Talking God Blessing Way. This situation results, presumably, from the importance of Talking God in both of these Blessing Way ceremonials and in ritual hunting.[4]

Since the use of pipes in curing ceremonials has been discussed in various works elsewhere, it will be treated here only in the most summary fashion. On the other hand, the data relating to the role of pipes in ritual hunting are meager in the extreme. This subject, therefore, will be treated in somewhat greater detail at the end of this section. According to informant 12, pipes might be used in curing ceremonials held for either humans or animals. Actually, the smoking of the pipe was an optional rite which might be included in a Blessing Way ceremonial at the bidding of the patient or his family.[5] That pipes were used also in connection with other groups of curing ceremonials is indicated by the accounts of other writers. The Franciscans describe a smoking rite from Coyote Way,[6] while Matthews has discussed the use of pipes in Night Way.[7]

To what extent the non-ritual smoking of pipes prevailed in the past is difficult to determine today. The Franciscans point out that while much smoking is done at the present time by both men and women, the tobacco, usually obtained from the traders, is wrapped in a corn husk and smoked as a cigarette.[8] In a ritual context, however, com-

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[1] Matthews states, "The Navahoes no longer make pipes and rarely use them,—the cigarette is their favorite,—but the pipe was once seen employed in the rites, and there are many traditions that pipes were formerly used and made by the Navahoes" (1902, p. 314).

[2] Hill speaks also of the smoking of Navaho tubular pipes in connection with peace making negotiations. He states that corn husk cigarettes were also employed for this purpose (1936a, p. 19).

[3] For additional notes on the Navaho classification of Blessing Way ceremonials, see Kluckhohn and Wyman, 1940, Appendix A.

[4] Some of Hill's informants maintained that Talking God controlled the game animals (1938, p. 99). This was also the opinion of informant 12.

[5] Wyman and Kluckhohn, 1938, p. 18. Hill mentions the use of a pipe in a Blessing Way rite for dispelling insanity and delirium (1936b, pp. 71–72).

[6] "The singer smokes this pipe facing east, and blows the smoke first downward to the earth; then to the sky, in front of himself, to his right, rear and left side, and finally from above downward. This is repeated in turn by the patient and all present." Franciscan Fathers, 1910, pp. 394–395.

[7] Matthews, 1902, pp. 308–309.

[8] Franciscan Fathers, 1910, p. 506. Dr. W. W. Hill obtained the following account from Pete Price of Fort Defiance.

"The earliest smoking that I have heard about is when they used to smoke oak leaves. They would get the leaves in the fall and lay them up. They also used wild tobacco. They all used sage brush leaves mixed with mistletoe and some other tobacco. In making cigarettes the oak leaves were the first wrappers that were used. Later corn husks began to be used as wrappers.

"A lot of smoking was done in a social way. If a person asks you for tobacco you must never toss your pouch to him. They used to say that tobacco was your mind and mercial tobacco is not employed, and wild tobaccos and other plants which are native to the Southwest must be used.[9] A discussion of the preparation of the smoking mixtures and tobacco offerings is beyond the scope of the present paper. This subject, however, has been dealt with at some length by the Franciscan Fathers and by Matthews.[10]

Although there are numerous references throughout the earlier sources to Navaho pipes and pipe usage, details relating to the manufacture of these articles are somewhat vague and inconsistent. The most complete account has been recently made available by Hill.

> Clay pipes were made in two styles: the old tubular form and the more recent elbow type. Those designated for ceremonial use had turquoise or white shell ground up with the clay. According to informants, both clay and cane stems were used. An opening was made in the bowl of the pipe with a twig and the stem was fitted into this. A difference of opinion existed as to whether pipes destined for ceremonial use were made by men or women.[11]

On the other hand, the Franciscan Fathers state that "the ceremonial pipes are conical in shape, and stemless, as the smoke is drawn through a small hole provided in the bottom of the pipe."[12] Later, however, they mention that "pipes with and without stems are mentioned in ceremonies and legends. . . . "[13]

In addition to the pipes manufactured by the Navaho for use in song ceremonials, Pueblo pipes, collected in neighboring ruins, were also employed for this purpose.[14] According to a Navaho who was not, however, a member of the Ramah group, such pipes are occasionally used in Blessing Way.[15] Any individual may find such a pipe, but it is not purposely sought after. These pipes are said to be unpainted, and may be used in ceremonials, even though they are partially broken. Informant 12 owns a small, black pipe (pl. XVI, e) which his father found in a Pueblo ruin.

> I used to use this pipe in hunting and for Game Way Blessing Way. Pipes for Blessing Way are best when you find them—you can find them easily if you know the songs; they were all made by the Holy People. I loaned this pipe around for all kinds of Blessing Way sings. Every time, I was paid a third of the singer's money.

TECHNOLOGY

The following account, relating to the manufacture of the "male" and "female" pipes for use in ritual hunting and Game Way Blessing Way respectively, was obtained from informant 12. Whereas an attempt has been made to eliminate repetitious statements and to arrange the events and technological processes in their approximate chronological order, the account is given, in so far as possible, in the words of the informant.

> You make the pipes while you are at home in the hogan; you have to sit on the west side of the hogan and face east. Before you is an unwounded buckskin placed with the head north, like the sun goes. Usually you make two pipes at the same time. The straight one—the white female pipe—will be used for Blessing Way; you use the female pipe at home when you sing for good hope. The other pipe—the black crooked one—will be used for hunting.

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you must never throw your mind around. Smoking will draw better thought without evil. Therefore any conversation without tobacco was considered not worth while.

"You did not borrow pipes. However, big cigarettes were passed around. By doing that everyone was able to concentrate on the thing that you were discussing. Women, the old ones, smoked. Everyone who was adult around the home would take a puff. It was somehow sacred. Children were not allowed to smoke. If they did they would grow up to be lazy and have bad dispositions. There were never any visions connected with smoking. The puffing of smoke to the four directions is not done except in a ceremony."

[9] Matthews, 1902, pp. 308–309.

[10] Franciscan Fathers, 1910, pp. 394–395. Matthews, 1897, p. 247; 1902, pp. 308–309.

[11] Hill, 1937, p. 20, figs. 4–5. Dr. Hill writes me that he obtained the following additional information from Pete Price.

"Pipes which were made ceremonial were used only in ceremonies. As a rule the pipes were studded with from one to three rows of four pieces of turquoise or white shell depending on whether the pipe was for a male or female patient. You would never lend one of these ceremonial pipes to a person unless he knew the ceremony that went with it. The reason that shell or turquoise was put on these pipes was because the songs mention the turquoise pipe or the white shell pipe."

Informant 12 was familiar with the cane-stemmed pipe, although he had never made one of this type himself. "They are used all around, just like the ones you find in the ruins." Informant 2 described and drew a pipe which was conical, but with a short length of cane fitted into the smaller end to form the mouth-piece.

[12] Franciscan Fathers, 1910, p. 287.

[13] Franciscan Fathers, 1910, p. 506.

[14] This practice of using ancient pipes from Pueblo ruins is mentioned by the Franciscan Fathers (1910, pp. 394–395). Again, Matthews speaks of such usage in connection with the preparation of tobacco offerings for Night Way (1902, p. 98).

[15] This informant, *de·ba*, lives in the vicinity of Wingate, New Mexico.

> The male pipe is the hunting pipe because men go hunting more than women, and when you hunt, you go crooked.
>
> Talking God made the male pipes in the first place, and Deer Raiser's Wife made the female ones.[16] That was way back in the beginning. The Holy People got together and decided to look ahead for the people. They talked it over and decided that some smoking should go for the good [to bring good luck] and some should go for the bad [to cure hunters of "deer sickness"]. The first pipe was made to straighten out Mountain Lion, Wolf, and Wildcat, who had all been mistreating the deer. It was made so that the deer could be brought back to life and cured.
>
> You make the hunting pipe first. If you have a woman, she works on the home pipe at the same time. She sits on the right side of the man, also facing east. Spread out along the eastern edge of the buckskin before the man are all of his valuables: silver jewelry, beads, bridles, quirts, and weapons. The "jewels" which are to be used in both pipes are placed to the man's right, while the clay is placed between each worker in a small pottery bowl.[17] Before each individual, between the clay and the valuables, is placed a small sack of wild tobacco.

The clay used in the manufacture of these pipes is obtained from localities where various animals come to lick salt.[18]

> Some you get in the mountains ten miles northeast of Luna, where the deer eat dirt and get their salt. Another place where the deer and the antelope come to eat salt is six miles southwest of Quemado. Another place is in the valley about thirty-five miles east of Springerville. Then you get some clay that has been chewed by prairie dogs and jack rabbits at a place five miles northeast of Two Wells. The old people used to get some that had been chewed by elk, somewhere to the south of Luna. So you get a handful of clay chewed by each of these animals—deer, elk, and antelope—and then get just a little bit that has been chewed by jack rabbits and prairie dogs. Just put a little corn pollen down where you get the clay and thank the animals for it. In the brush hogan while you are out hunting, you sing four pipe songs for the clay; then you go out and get it, but you don't sing while you gather it.
>
> When you are making the pipes at home, you grind the clay on a piece of rough stone with another piece of stone. Then you have to separate the clay and put it in two cups. You have a bunch of different kinds of weeds that have been knocked down by the antlers of deer while they are feeding. Soak these weeds in water and then drain the clear water off. This is the water you mix with the clay. The clay for the hunting pipe is stirred with a stick of *ceʔésda·zí* [*Cercocarpus montanus* Raf.]; you use this because the deer always hit this plant with their antlers. For the home pipe, you use a stick of *łi·s báʔł* [*Populus tremuloides* Michx.]; this plant just grows on the high mountains. For the home pipe, you don't use any of the ground up pottery, but for the hunting pipe you do. As soon as the woman finishes the home pipe, the man breathes on it four times. This makes it stay together.

As soon as the paste has been mixed, a pinch of the pulverized "jewels" is mixed into it. Then a lump of the paste is taken and rolled out into a sausage between the palms, while additional modelling is accomplished by the fingers. The pipes are smoothed with a small tool, *náłosce be· di·lkǫhí*, carved from the wood of *dahʔbaʔ*, *Fraxinus cuspidata* Torr. This implement, about three inches long, is sharpened along either side and rounded at one end, while the other end is left square. The rounded end is employed in shaping the bowl. Whenever the man wishes to moisten the pipe during the scraping, he places a pinch of deer medicine in his mouth and chews it, using the saliva for this purpose. The woman uses yellow or white corn meal in the same manner.

The "male" pipe is bent into shape before it is bored, after which the bowl is modelled and applied to the broader end. A hole is then bored through each pipe with a stick.

> The man uses a little stick of *dahʔbaʔ* the size of a piece of bailing wire to punch the hole through his pipe. The woman's stick will be *dówóži·žin* [*Sarcobatus vermiculatus* (Hook.) Torr.]. You bore each pipe four times from the mouth end. While you do this, you pray so that the pipe will be smooth inside and won't crack when it dries.

While they are working on the pipe, the man and the woman must observe certain ritual restrictions. During the modelling of the pipes they may not laugh or talk in a loud voice, and must be careful not to break anything. When the man wishes to pass any of the pipe making paraphernalia to the woman, he must hold the object between his thumb and index finger, and not between his first and second fingers. While a woman is menstruating, she may not make a pipe, and must take a sweat bath before she may resume work on it. After making a pipe, a man may not sleep with his wife until four days have elapsed. Four days after the pipes have been completed, the couple must take a sweat bath and wash their clothes. All the individuals who have watched the pipes being manufactured must take sweat baths at this time. This is done "so that everything will be clean again."

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[16] Matthews records a legend which deals with the characters of Deer Raiser and his wife (1897, pp. 184–192).

[17] For a description of the "jewels," see Kluckhohn and Wyman, 1940.

[18] Pete Price of Fort Defiance, Dr. W. W. Hill informs me, related the following: "There is a place where you can get clay for pipes near the mouth of Whiskey Creek. The name of this place is 'Where pipes are made.' The clay from these was brought to the ceremony where holy objects were being made and the pipes would be made there."

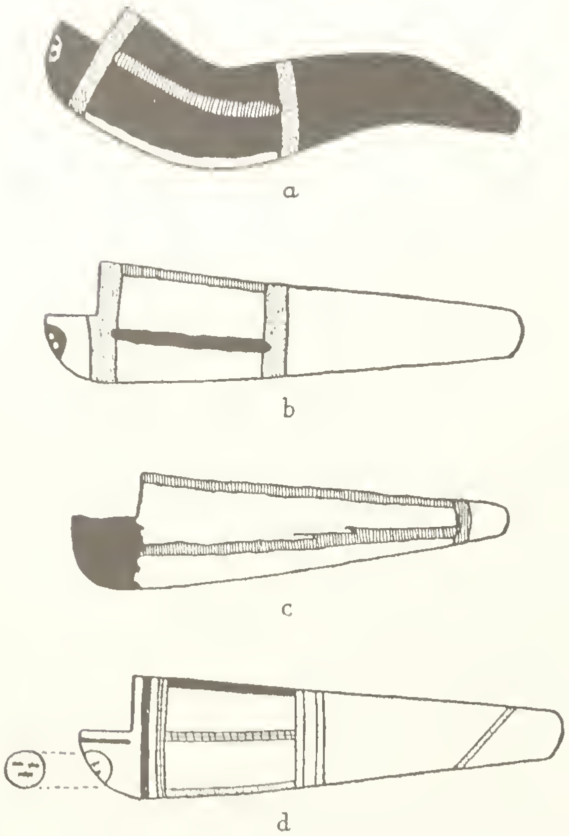

Fig. 7. Navaho pipes.

a. Ritual hunting pipe made by 12.
b. Game Way Blessing Way pipe made by 12.
c. Game Way Blessing Way pipe made by 36.
d. Game Way Blessing Way pipe drawn by 12.

First the man finishes the modelling of his pipe, and places it before him with the bowl pointing to the east. With the pipe resting in this position, he sings four songs: Mountain Song, Pipe Song, Talking God Song, and Earth Song, in the order stated. Following this, the woman models her pipe and sings the following songs: Mountain Song, Changing Woman Song, Yellow Corn Song, and Corn Bug Song. When the modelling has been completed, the man takes up the "male" pipe (the one later to be painted black) and also a small piece of lignite from the supply of "jewels" beside him.

> This will be a little round piece. Then he blows deer medicine from his mouth on the lignite two times. Then he sinks the piece of lignite into the top side of the pipe the width of one finger [measured] back from the bowl end. With this he names the pipe *bahžini nálosce*. After the piece of lignite is stuck down into the pipe he says, "Your name will be Lignite Pipe." Then he smooths it over. When the woman finishes her pipe—the one they will paint white—she holds it while the man put the *yo·łkâi* into it and names it White Shell Pipe. A woman can't name a pipe herself. If you make four pipes, the man puts *doẋiži·* into the blue pipe and names it Turquoise Pipe.[19] Then the woman holds the yellow pipe while the man puts *di·čîli* into it and names it Abalone Shell Pipe. When Talking God made the first male pipes, one was of solid lignite, while the other was solid turquoise. Deer Raiser's Wife made one of her pipes of white shell and the other of abalone. Nowadays, people just use little pieces of these things.

As soon as the pipe has been named, corn pollen is sprinkled over it and it is allowed to dry.

After the construction of the pipes has been completed, the woman has Talking God Blessing Way sung for her, while the man has Game Way Blessing Way sung or, if he knows it, he sings it himself. Since a pipe should be allowed to dry for four days, the date set for the ceremonials is calculated in terms of this factor. Pipes may be dried on a buckskin inside the hogan, or outside in the crotch of a tree. Should a sheep or dog urinate on the pipe, "it would be no good for anything."

The pipes are fired on the fourth day after their completion.

> You go out a little ways on the east side of the hogan and dig a little pit about a foot wide. For the hunting pipe you use deer manure and sheep or horse manure mixed for fuel. Sometimes the woman fires her own pipe and uses horse or sheep manure; for a Blessing Way pipe you can use wood if you want to. Put a flat rock in the pit—get a hard one that won't crack—and put the pipe on it with the bowl to the east. You can't walk on the east side of the pipe while it is baking.

The fuel is placed around the pipe, adding it in a sunwise direction, so as to form a dome-like structure. When this has been completed, wood and rabbit brush are placed around to serve as tinder, and the kiln is lighted. The pipes are allowed to burn for from ten to twenty minutes, and no songs are sung during the firing. The hunting and Blessing Way pipes may not be fired together, but may be fired in the same pit provided that it has been cleaned out between times.

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[19] Mythological references to the smoking of Turquoise Pipe are frequently encountered. See Father Berard Haile, 1938, pp. 182–185; Goddard, 1933, pp. 46–47, 142.

> While the pipe is burning, you pray that it will be a good pipe—be solid for always—and that it will bring good things.

When the firing has been completed, the pipes are placed on green piñon boughs and allowed to cool.

> Then you sprinkle water on the fire to put it out; this brings steady rain. The clouds of smoke that come out of the pipe when you smoke it are rain clouds. That's why you smoke—to make it rain. When you finish putting the fire out, you sprinkle corn pollen on the dead coals and say a prayer for good luck.

After the four days have elapsed, the woman has a Blessing Way sung over herself and the pipe. This ceremonial lasts "part of one night, all the next day and the next night."[20] At this time the man has Game Way Blessing Way, a ceremonial of the same duration, or sings the songs himself. During the intervening day, while the ceremonials are in progress, the pipes are painted.[21]

> As soon as the paint dries, the woman takes the medicine bundle for Blessing Way and puts it in the basket that she used to wash her hair in. First she dries out the basket with yellow corn meal. Then she puts the pipe on top of the bundle and puts the basket on a buckskin—the one they used when they made the pipes. Then the woman sings over the pipe and the woman who sits behind the basket. All of her goods—silver belts and beads and bracelets—are piled on the buckskin in front of her. That evening they sing all night and smoke the pipe four times.

Essentially similar behavior patterns seem to have prevailed, judging from the account related by 12, in the Game Way Blessing Way and the painting of the hunting pipe.

In painting the pipes, as stated previously, five colors were used: red, yellow, blue, white, and black. In mixing the paints for the hunting pipe, leaves of *Yucca baccata* or *glauca* were heated in the coals of the fire-pit, and the juice wrung out onto small, flat stones upon which the pigments were heaped. The yucca plant must be one that a deer has "hopped over." For the hunting pipe, the paint brush was a small sprig of *Fraxinus*, sharpened to a point, while for the Blessing Way pipe, a brush of *Sarcobatus* was used. In mixing the paints for the Blessing Way pipe, the pigments were not mixed with yucca juice, but with *tóʔalaná·ščí·n*[22] ("this is water that you get after it has rained hard and all the water comes together in a pond") or with *tó biyá·ž* ("this kind of water you find in little pools in the bottoms of arroyos").

If four pipes were manufactured, each would be painted basically with one of the following colors, each color being associated with sex and direction: black (male, east); blue (female, south); yellow (male, west); white (female, north).[23]

> There should be a spotted pipe for the center, but instead we carry the little pipe called *nálosce łikiž* or *naʔaže·h nálosce yází* when we are out hunting.[24]

The following description of the white, "female" pipe (fig. 7, d) applies in general, with certain appropriate changes in color and "sex," also to the other three.

> On the white pipe, you paint the body all solid back to the mouth end, and you do the same with the yellow pipe. In the blue and black pipes you paint the body back to the slanting line, but don't paint back of this. On all the pipes you draw the slanting line in with yellow or white, even if it doesn't show. Be sure and put it on. Yellow and white are good; men were made up of white corn and women of yellow corn, and Blessing Way goes that way. The female pipes will have a yellow slanting line at the mouth end; this is the woman's pipe, and the line is called *nadą́ʔáłcoi*, "yellow corn." On the man's pipe, the line will be white and will be called *nadą́ʔáłgai·*, "white corn." You can't put black or red next to your mouth; if you do, it means you want to kill something all the time. If you are just going to use the pipe out hunting, then it is all right to put red next to your mouth. But sometimes they ask you to put up a smoke at home for the horses and sheep or the people. Black or red should go on the bowl end of the pipe—next to the fire.

When painting the horizontal lines on the body of the pipe, the pipe is rotated sunwise (i.e., away from the man who is painting it). There are four of these lines, which are called *šáhbiƛ̓ó·l*, "sun beams." Viewing the pipe laterally, the bowl directed to the left, the top line is black, the line on the near side blue, the bottom line yellow, and the line on the far side white. On the under side of each horizontal line (viewed in the position described), a horizontal line is drawn in red next to each, but allowing a small strip of the white background to show between.

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[20] This is the stock phrase used to describe a "one night" ceremonial.

[21] Informants 1 and 12 agreed that pipes were never painted before the firing.

[22] Cf. Kluckhohn and Wyman, 1940.

[23] This is the customary color-direction symbolism encountered in Evil Way ceremonials. Kluckhohn and Wyman, 1940. Just exactly why Evil Way symbolism should be associated with pipes manufactured for use in hunting and Blessing Way is not clear.

[24] "Usually we don't make all the pipes for hunting, but instead just one—the black one. There are supposed to be four, because this is the way things started. If you don't have a crooked pipe, it is all right to use the straight one out hunting, only you have to paint a red slanting line around the mouth end" (12).

> You get this red paint from the Hopi, Zuñi, or Laguna Indians. This paint is called *ʔana·cí·h*, "enemy red paint", because these people are enemies.

The white paint is called *na·saláλe·ž*;[25] "this was the first clay they used when things started." The four vertical lines are called *nází·lid*, "rainbow." These are black, blue, yellow, and white, in order from bowl to stem.

In the case of all four pipes, the colors and arrangements of the horizontal and vertical lines are constant features. In all, the line around the bowl of the pipe is painted black, as are the features of the "sun" (located on the bowl end of each pipe). The color of the sun, however, is a variable; on the white pipe it is yellow; on the black pipe, blue; on the yellow pipe, black; and on the blue pipe it is white.

Occasionally crude, semi-naturalistic motifs were painted on the pipes which were used in ritual hunting.

> When you paint an animal on the pipe, do it while you are out hunting—not at home. On the black pipe, draw a blue deer facing your mouth; when you are smoking the pipe, the deer will be on the left side of it.[26] You paint the pipe in this way when you leave out the rainbow and sunbeams. On the right side of the pipe you draw a tobacco leaf pointing into your mouth. You paint these in blue on the black pipe.

A second account was obtained from informant 12, which relates to the manufacture of the "little pipe." For convenience in reference this pipe, called *náłosce łikiž*, "spotted pipe", or *naʔaže·h náłosce yáží*, "little hunting pipe", will be designated here as "temporary pipe", since it was manufactured as necessity dictated and disposed of afterward. Whereas the pipes described above were associated with sex and direction, the temporary pipe is said to be associated with the "center", and to be without sex; in fact the term regularly applied to the transvestite, is also applied to this pipe. Its color is conceived of as "spotted" or variegated. Again, whereas the other pipes might be manufactured at home and by women, the temporary pipe was made by men only, and then only in the brush hogan during the course of a hunting expedition. When the pipes are made at the hunting camp, the materials (clays, paints, and occasionally temper) are carried on the expedition in buckskin bags.

> If you are out hunting and need a pipe, but don't have one with you, you make just a little one. You only make this when you forget the good pipe. You just use it while you are hunting, and then put it away; you can't bring it along home. This pipe was first made by Deer Raiser and his wife—it was made to kill deer. You can't use it when anyone gets sick from hunting.
>
> This pipe is straight and not painted at all; it is just like the woman's pipe, but smaller. You make it in the brush hogan while the other men are out hunting. The men who are hunting with you can watch you make this pipe if they want to, but they can't make any noise or go out of the brush hogan until you tell them to. If they go outside and break a stick or kick something, then the pipe will split.
>
> The little pipe is made from the clay that has been chewed by deer, but you don't mix up any other clay with this; you don't have to get the clay that has been chewed by other animals because you are in a hurry. You have to soak the weeds rubbed by deer's antlers in the water—a hunter will always have these with him. If you don't have a cup with you, just pour a little water out in the center of a buckskin and mix in the weeds with the water. Then you take out the weeds and put the clay in. You don't have to put in the ground up pottery unless you have it with you. Then you roll out the pipe and punch it through, and make a little bowl at the end of the stem.
>
> In this pipe you put lignite in the top and white shell underneath. Then you put blue shell under the bowl. Then on the right side of the end that goes in your mouth, you put abalone shell. This makes the pipe spotted. If you forget to put in the jewels, then you have no pipe—that is what the Holy People say.
>
> If you make the pipe at night, you let it dry on the leader's side of the fire. In the daytime, you can let it dry outside; it dries pretty quick.
>
> Then you pull out some coals from the fire-pit in the brush hogan and put the pipe over on the west side of the fire, where the leader sits. Cover over the pipe with coals. After you leave it for about five minutes, it is ready to take out.

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[25] Cf. Kluckhohn and Wyman, 1940, p. 72.

[26] Matthews has a legend with a description of Deer Raiser's pipe. "Presently the old man returned with a pouch that had pictures of the sun and moon on it, and with a large pipe . . . decorated with figures of deer, antelope, elk, and Rocky Mountain sheep" (1897, p. 177).

If you want to, you can rub white clay all over it. Soak some of the weeds rubbed by deer's antlers in the water, and then mix this water with the *na·saláλe·š*. Then plaster this on the pipe with your hand.

As soon as the pipe is dry, you decide whether you want to smoke in the brush hogan or on top of the mountain. You have to be careful with this pipe. If you break it while you are out hunting, you have to have Game Way Blessing Way as soon as you get home, and all the men who hunted with you have to come.

Then on the day you break camp, you put this pipe on the right side of the deer antlers [which have been carried two hundred yards or so from the brush hogan and deposited facing east.] You put the pipe in the shade of a piñon branch and sprinkle corn pollen on it. Then you walk around [counter-clockwise] to the bowl end of the pipe—it is to the east—and you kneel on your right knee and wear a handkerchief around your head.

You draw two lines with pollen to the east, under the deer antlers, and you thank the deer and tell them to go home. You thank Talking God, Deer Raiser, and Changing Woman. Then you draw two pollen lines to the east on top of the deer antlers, and two other pollen lines under the pipe and say *kodę̂· hožǫdo šinálosce*, [in this way beautifully, my pipe]. Then you draw two pollen lines on top of the pipe and say:

kodê·ˀ łá· dí·šǯį́ diniˀ bitahǯį̂ˀ kóšidí·lí·ł!
Along here this very day game among lead Thou me!
ˀáxéhe· naxodéšǯǫˀ holˀá·gó· łá· kółê·do·le·ł
Thanks, I have done it in easy fashion, in future Times always let it be so
ˀáxêhe· ha·šcéłtiˀi šaˀi·nłco·d!
Thanks, Talking God, you have given me food.

After this you just sit quiet for two or three minutes. Then you thank Talking God and call him "mother's father," and Changing Woman—you call her "mother," and Deer Raiser. You call him 'mother's father' also. You thank them for the deer and for the good luck, and that none of your men got hurt, and pray that it will be the same for other times. You also pray so that everyone at home will be well. You speak to the antlers and tell them to go home; say, "I have given you life again."

The pipe goes to *tóne·nili*, the little herder—you call him "mother's father" also.[27] He takes care of the fawns that are too little to keep up with the rest. He will get the pipe right away, and he sure thanks you for it. That is the reason why you make the pipe little, because this man is little. When you go back some day and look for that pipe, you can't see it any more.

Of the five pipes manufactured by Ramah Navaho informants, three were observed during the course of their manufacture, while the two additional pipes (pl. XVI, a, b) were made by informant 12 during the winter of 1937.[28] These latter pipes were the only ones which were manufactured of the proper clay.[29]

In the case of informant 1, the manufacture of the pipes took place under a tree, some distance away from the women and children, in the family shade. The clay, a white, fine pottery clay, he had bought for another purpose from a kinsman, who in turn had obtained it "half-way between Thoreau and Crown Point."

The clay was ground between two ordinary smooth stones (1). After this was done, two small, black-on-white sherds were produced, each about an inch square in size. These were collected in a nearby ruin and were ground to a fine powder in the manner described for the clay. The powdered tempering material was then mixed with the clay, and the water was slowly added until the paste was about the consistency of bread dough (1). In the case of the female hunting pipe made by informant 36, only a half of a small corrugated sherd was employed as tempering material.

The pipes were then modelled, the bore through the stems being accomplished with a piece of common bailing wire (1). After this had been completed, the pipes were left in the crotch of a tree in the shade to dry for about thirty hours. When thoroughly dry, they were smoothed with an ordinary metal knife. Ordinarily a knife is called *bêš*, but in this case it was referred to as *céˀáwózí*, which term is also applied to the polishing stone used in smoothing pottery (1). When this process was completed, the pipes were ready to be fired.

The pipes were fired in the fire-pit inside of the hogan, dry piñon branches serving as fuel. While these burned down to coals, informant 1 went out and returned with a can of piñon gum, with which he smeared the pipes before putting them in the fire. Then the pipes were covered with coals and allowed to remain for twenty-five minutes. The female hunting pipe made by informant 36 was fired for twenty minutes. While Dr. Kluckhohn was excluded from the hogan during the actual firing, informant 1 maintained that this process was not accompanied by songs and prayers. After the pipe had been removed from the coals, each was rubbed for about five minutes with a greasy cloth.

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[27] This mythological character is said by Matthews to be a rain deity. In certain public dances, he is represented by a masked man enacting a clown (1897, p. 230).

[28] The account which follows is based on observations made by Dr. Kluckhohn. The two pipes manufactured by 1 (pl. XVI, c, d) are of the type formerly used by this informant in Talking God Blessing Way. The third pipe (fig. 7, c) was made by informant 36, and is of the type formerly used in ritual hunting and in Game Way Blessing Way.

[29] Informant 12 obtained this clay in a rite with his teacher at Big Willow, near Quemado.

After the pipes were fired, they were painted. In the case of the elbow pipes (pl. XVI, c, d), the female pipe was painted blue, while the male pipe was painted black (1). No additional decorative motifs were employed. The techniques utilized in the manufacture of paints for use on pipes have been discussed previously.

The other pipes bore geometric or vaguely naturalistic decorative painting.[30]

LEARNING

In the Ramah area at the present time, there are but two individuals familiar with the techniques of pipe manufacture, informants 1 and 12.[31] The clan affiliations of these men are clan 22 and clan 37 respectively. Both had learned to make pipes from the same individual, *ʔal·ĺanzíhí*, who is now dead, but was formerly a member of the Two Wells group. "We both learned because we were good friends of this man, and used to hunt with him all the time" (12). Since this man's clan was 32, it seems possible that learning to manufacture ritual pipes, as in learning song ceremonials, was not dependent primarily upon clan affiliation, but rather upon blood relationship and friendship.[32] There were, however, in the opinion of 12, certain people who, because of their clan affiliations, were considered to be especially skilled in making pipes. "The Deer Water People [clan 30] and the people of the other water clans make the best pipes." The people of clan 19, according to 12, should not make pipes, "Their pipes won't be worth anything and will bring bad luck. Whenever you see a pipe, you ask who made it. If one of these people did, you won't buy it. If you buy it, the country will all dry up."

In the course of becoming a hunter, the novice learned the ritual and songs from his teacher, and a fee was usually exacted by the latter for his services.[33] The preparation of the hunting pipes, however, was regarded as an optimal element for which a special fee was paid. "When you learn hunting, you have to pay for four things separately—the songs, the pipes, the medicine, and the whole thing" (12). This informant related the following account relative to learning pipe manufacture

> When I learned to make pipes, I was out with my teacher and another man who also learned. The best time to learn about pipes is when you are out hunting. At night he told us all the stories in the brush hogan, and in the day time he showed us. He got some mud and showed us how to mix it—it was just mud and not real clay, because it was only for practice. Then later on he told us to get ready for it and to bring the right clay and all the other things. I mixed up the mud and then he made a pipe for me, and I smoothed it. The other fellow couldn't make his. Every time he punched it, he made a big hole in it. So the man who was showing us had to fix his pipe too. He was always mentioning the red mark that goes next to your mouth when you smoke the hunting pipe. He gave me some of the Enemy Red Paint. I had to pay him extra for learning about pipes. I gave him three strings of good beads with turquoise on them—together they were worth about forty dollars.

The songs and rituals which accompanied the manufacture of the pipes were a "little bit different" from one individual to the next. Informant 1, while manufacturing a Blessing Way pipe for Dr. Kluckhohn, was very reluctant to allow 12 (who was acting as interpreter) to watch the proceedings. Informant 12 explained this by saying that 1 had "another rite." How widely these rites differed from one individual to the next, it is impossible to say; it seems likely, however, that they were basically similar, and differed only in the matter of detail.

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[30] The first pipe illustrated (fig. 7, a; pl. XVI, a) is male. Length, 10 cm.; diameter at bowl, 2 cm. The body, painted black, bears four parallel lines of red and white, alternating; these are bound between two yellow lines which encircle the body. Bowl, black; sun, white with three black dots (12). The second (fig. 7, b; pl. XVI, b) is female. Length, 10 cm.; diameter at bowl, 2 cm. Body white, bearing four parallel lines of red and blue, alternating; these are bound between two yellow lines which encircle the body. Bowl, white; sun, black with three white dots (12). The third (fig. 7, c) is female. Length, 8.5 cm.; diameter at bowl, 2 cm. Body, white, bearing four parallel lines in red. These lines extend the whole length of the body from the bowl to within one centimeter of the mouth-piece; at this end they are bounded by a red line which encircles the stem. Bowl, black; sun, black, with three white dots (36).

[31] Informant 36 learned to manufacture Game Way Blessing Way pipes, but was taught by her husband, 12. A fourth informant, 2, was familiar with the type of hunting pipe described by 12, and was able to relate some of the details of its manufacture, but had never made a pipe himself. A fifth informant, 5, learned a portion of Corral Way, but failed to learn how to make the pipe. By way of explanation, he said, "The man who taught me said that there was a pipe for this Way, but he died before I could learn. He said that if you could find a pipe in a ruin, it would do; but if not, you had to make one. He didn't tell me what it was like."

[32] Kluckhohn, 1939, pp. 65–66. Hill states, "There was no clan specialization in any particular Way of hunting. A leader would teach anyone who asked to be instructed." (1938, p. 100).

[33] Hill, 1938, pp. 100–101.

The role played by women in the manufacture of pipes is rather obscure. According to informant 1, a woman can and does make the female pipe (or pipes), but the male pipe must always be prepared by a man. Informant 12 stated that "his Way", a woman makes the female pipes and that "she has to go hunting with me—she has several songs. If a woman doesn't know the songs, she can have a man come over to her place and sing for her while she makes the pipe. A woman can make pipes if she knows the songs, and also a man will make the female pipes if he can't get a woman to make them" (12).

According to 12, the first pipe to be made by a man who is learning the rite must be painted black. Additional pipes must be painted blue, yellow, and white, in the order stated until four have been manufactured.

PIPES IN RITUAL HUNTING

Pipes seem to have been used only in connection with the ritual hunting of "big game": deer, elk, and antelope (12).[34] According to the Navaho, these animals (and also bear and eagles) were "hunted"; all other animals were simply "killed."[35] Since hunting pipe usage is an integral part of hunting ritual generally, it is impossible to discuss this subject adequately if it be divorced from its immediate context. For this reason, it is necessary to preface a discussion of hunting pipes with a brief summary description of Navaho ritual hunting.

Hunting, as curing, is conceived of as a specialized career. "Hunting and singing don't go together. One goes one way, the other goes the other" (12). This fundamental distinction between killing and curing is brought out clearly by Dr. Hill when he points out the complete reversal of the psychology of the participants in a hunting expedition.[36] Whereas at home one did not speak of death, blood, and killing, on hunting trips the hunters kept their minds on killing and death. While dreams of killing and defeat ordinarily were considered to portend evil, on hunting expeditions such dreams were regarded as good omens. Finally, the hunter must purify himself by means of a sweat bath before he might resume everyday life.

The patterns of ritual hunting behavior closely parallel those of curing and warfare. As there are "Ways" in curing, so there are "Ways" in hunting.[37] Whereas each Way is in general similar to the others in structure, each is recognized as distinctive and differs in the matter of details. Leadership in hunting, therefore, as in curing, was in the hands of specialists who had learned the ritual. It was considered unprofitable as well as unsafe for an individual who lacked such training to indulge in the pursuit of ritual hunting. With this in view, the following statement is understandable: "Not everyone can make a pipe; they are afraid to make them. A hunter who knows how can make one, but he can't make too many" (12).[38]

Pipes are smoked on hunting expeditions on at least three occasions: (1) to assure the continuation of good luck; (2) when the luck is very bad; (3) when a hunter becomes "sick from the deer."

Smoking in order to promote the continuation of good luck seems in addition to have had some entertainment value. "When out hunting and the crowd wants to, the pipe is passed around the brush hogan" (12). The leader of the hunt smokes it first, after which it is passed sunwise around the circle, so that each hunter smokes it four different times.

The following account of a rite to change the luck from bad to good was obtained from informant 12. This account is undoubtedly incomplete. It is unfortunate that, due to the scarcity of men familiar with ritual hunting in the Ramah-Atarque area, corroboratory evidence was not obtainable.[39]

> Usually you don't smoke out hunting unless you are having bad luck. Sometimes the men will all want to smoke because they know that it gives you good luck. Then you take them up on top of a hill before it gets to be noon,

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[34] Hill states that elk were occasionally hunted in ritual manner (1938, p. 101).

[35] Hill, 1938, p. 97.

[36] Hill, 1938, p. 98.

[37] Hill, 1938, pp. 101–106.

[38] The latter part of this statement seems to refer to the reluctance on the part of the Navaho to overdo anything, lest he "wear out" his skill. Reichard, 1928, pp. 147–148.

[39] Hill refers to the practice of smoking during ritual hunting in order to change the luck (1938, p. 141).

and you put up a smoke there. You have to do this before noon, because right away you are going to do a lot of killing.

This rite, which is called *diniʔe· k̓ehgo ʒiłbíłátadí di·hilyéh*, Mountain Peak Game Way is not performed with more than five hunters.

> If there are too many, they make mistakes and laugh. If you have more in the hunting party, let them go hunt. When you get home at night, you can have another smoke for the rest of the people. So you pick your men at the bottom of the hill and give them instructions and tell them what to do. They shouldn't break sticks or throw rocks or break anything. Then you sing a mountain song at the bottom of the hill, and another half way up. Then you are ready to start. If there is a woman along who belongs to Deer Water clan [clan 30], she can come up on top of the mountain if she knows the songs. If she comes along, it is more lucky than anything else. Usually when they go up on top of the mountain with the woman, they smoke the female pipe [either one]. If most of the men want to smoke the male pipe, then you do that.

When the top of the hill has been reached, the leader draws a circle, open to the east with corn pollen. "You don't build a brush hogan because it takes too long." The leader of the hunt sits on the west side of the circle, facing east, while the other men sit around the circle on either side of him. He places his pipe (with the bowl to the east), tobacco, and medicine together on a small square of unwounded buckskin which is placed before him, near the spot where the fire-pit would normally be. The string of the tobacco pouch is undone, and two songs are sung while the paraphernalia rest on the buckskin as described.

The hunters may be dressed in any fashion, but must wear moccasins and a handkerchief around the head. They sit with left knee bent, kneeling upon the right knee. Each man has placed his weapons and hunting knife before him in such a way that the points do not point to anyone in the group (i.e., they must point outside the circle).

While inside the circle, no one may laugh or joke and all must refrain from loud talk. If it is necessary to point, one finger alone may not be used; one must either point with all fingers, or the thumb alone.

Taking up the pipe from the buckskin, the leader carries it back to his seat in such a way that the bowl always points east. If he makes a mistake and turns the pipe, he must turn it all the way around again in a sunwise direction. Then the leader takes from his medicine bundle a little piece of rock crystal, *cáγáʔdiñdíni·*. The pipe is filled with tobacco and the rock held up to the sun, and then touched to the smoking mixture. "This is to light the tobacco from the sun."[40] Following this, a strike-a-light is struck and the spark caught in shredded cedar bark. From this the leader lights the pipe. Taking two puffs, he blows the first to the earth, the second to the sky; each puff is accompanied by a song. The leader then passes the pipe to the man who sits in the position immediately south of the "doorway" of the circle. In passing the pipe, the bowl must always point behind (i.e., to the west), the way in which the pipe is to travel. If the leader is unable to reach this man directly, a middle man passes it on to him, taking care not to turn the pipe. This man takes two puffs, and each time blows the smoke into his palms and applies it to his body according to the order followed in song ceremonials.[41] The next two puffs he applies to his weapons. The smoke is applied to the body and the weapons to prevent injury from bear, snakes, lightning, and "bad deer." The smoker is thereby guarded against such injury "for always, not for just while you are hunting" (12). Then he passes the pipe to the man who sits to his left in such a way that the bowl travels sunwise. This next man smokes in the same manner, and the pipe progresses around the circle—passing over the leader who smoked it first and who is singing all the while—until the position to the north of the "doorway" is reached.

After the last man has smoked, the pipe is passed (in such a way that the bowl continues to travel sunwise) to the leader, who receives it and places it back upon the buckskin as before.

If the pipe is not empty after the last man has smoked, it is passed in the aforementioned manner to anyone who wishes to smoke again. Should the smoking mixture give out before the circuit has been completed, the leader goes over to the last man to smoke and refills the pipe.

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[40] The hero in a legend recorded by Matthews lights his pipe in this manner: "He filled his pipe with the mixture, lighted it with the sun, sucked it four times till it was well kindled . . . " (1897, p. 176). He states that this method is also employed in lighting the reed cigarettes offered in ceremonials, and that the stone used is a rock crystal (p. 42). The practice is also mentioned by Father Berard in an Enemy Way legend (1938, pp. 104–105).

[41] See Kluckhohn and Wyman, 1940. Franciscan Fathers, 1910, p. 371.

When the pipe has been returned to the buckskin, the smoking is finished. The leader then removes the ashes from the pipe and places them in his left hand. Taking a pinch in his right hand, he applies them to his body and weapons in the same manner in which the smoke was applied. All present do likewise, in the same order in which the smoking proceeded.

Following this, the leader takes up a little sack of hunting medicine,[42] chews a pinch of it, swallows some, and applies the rest to his body and weapons. The sack of medicine is then passed to each man, as in the case of the tobacco ashes.

After the medicine has been placed back on the buckskin with the pipe and tobacco, a small bag of red paint, *čí·hdok̓o·z*, is taken from the bundle. This paint is made of red ocher ground together with salt, *talƛ̓áh halá*, obtained from the bottom of the Zuñi salt lake,[43] The bag containing the paint also contains a mountain lion claw. The leader licks the claw, dips it into the red paint, and then puts the paint into his mouth. This procedure is repeated four times in all, and then the paint and the claw are passed to all present. This rite is performed to prevent deer sickness, and it concludes the smoking ritual.

The pipe, tobacco, and medicines are wrapped in the unwounded buckskin and tied. All of the hunters arise at the same time and leave the circle in a sunwise direction. No one may cross the pollen line.

According to informant 12, the smoking ritual described above may be included in the rituals of Wolf Way, Mountain Lion Way, Talking God Way, and Tiptoe Way.[44] "These Ways all help each other and go together." This man includes all of the afore-mentioned Ways in a "super-Way" which he called *hašč̓éltiʔí k̓ehgo diniʔe· k̓ehgí*, which may be translated Talking God Group, Game Way Branch.[45]

Pipes may also be smoked on hunting expeditions in order to cure a man who has become "sick from the deer." The following account was obtained from informant 12.

> Sometimes a man will get sick from the deer when he is out hunting. Then you put up a smoke for him out there. But sometimes he will get sick two or three years later, and then you have to put up a smoke at his hogan. They can tell what made him sick by Hand-Trembling or by Star Gazing.[46] You get sick when you are hunting by walking between the leader and the fire, or if you butcher the deer or cook the meat wrong.[47] All these things make you sick in Game Way. These little sicknesses can be cured by deer medicine or by smoking. But if you haven't listened to the leader, a deer is liable to blow at you just once, and it will make you very sick.[48] Then you have to have the smoke. If this happens, your partner will come back to the brush hogan and tell the people. Then the leader will go over to where the man is sick and give him some deer medicine. Then he will be able to walk back to the brush hogan. He will be sweating all over and breathing like he has run a long way. Here they put up a smoke for him. If you don't have a pipe, you can just roll up the tobacco in a corn husk.

In addition this informant stated that if the man contracted "deer sickness" at home, a smoking rite might be incorporated into the ritual of Game Way Blessing Way.

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[42] This medicine is composed of weeds which have been brushed by the antlers of a buck, and also of kernels of red and black corn.

[43] This paint, according to informant 12, may be prepared only by a girl of Deer Water clan (clan 30) at the time of her first menstruation. "This red paint is used to straighten everything out when someone has burned deer hair or bones. You mix this paint with ashes. Then when the deer comes back to life, he won't be hurt anymore."

[44] See Hill, 1938, pp. 101–122.

[45] This suggests that categories of a wider extension may possibly have prevailed in the past in respect to Ways of ritual hunting just as they do today in regard to curing ceremonials. See Wyman and Kluckhohn, 1938.

[46] For a discussion of these methods of divination, see Wyman, 1936.

[47] Wyman and Kluckhohn summarize various types of infection contracted from animals (1938, pp. 13–14).

[48] In speaking of certain lesser rites that may accompany the ordinary hunting rituals, Hill states that "the leaders had at their command ceremonies for curing men who had inhaled the breath of a deer" (1938, p. 143).

PART IV

COMPARISONS AND CONCLUSIONS

PART IV. COMPARISONS AND CONCLUSIONS

IN the foregoing pages, an attempt has been made to present such facts relating to the manufacture of Navaho pottery as are ascertainable today through field research and a survey of the pertinent literature. It would now seem profitable to consider briefly the techniques employed by neighboring tribes in an attempt to place Navaho painted pottery making with reference to the general Southwestern picture. Whereas it is realized that any final historical interpretations with regard to Navaho ceramics must take into account the affinities of the unpainted utility ware, it seems justifiable at this stage in our knowledge to confine our discussion to the painted ware alone.

The results of this comparative survey were tabulated to form an element list, comprising some seventy items, which serves as the basis for the following conclusions.[1] These seventy items were grouped together under four general headings: (1) Construction; (2) Slipping and Finishing; (3) Painting; (4) Firing.[2] Some of these items must be considered as of highest value in a study of comparative ceramic technology: for example, the nature of the temper material, method of coiling, use or non-use of paddle and anvil, method of applying slip, nature of the pigment and its medium, painting before or after firing, type of kiln used, and the nature of the fuel. Other items considered seem to be of lesser importance, but are, none the less, interesting in their ethno-geographical distributions: for example the implements and techniques used in winnowing and grinding clay, scraping and polishing tools, type of paint brush used, and the methods of protecting the vessels during the burning. In compiling this list, only those tribes have been included of whom there exists an adequate, detailed account relating to the techniques of pottery manufacture.[3] So far as the writer is aware, no such an account is available for any Apache group, It is likewise unfortunate that, due to the obsolescent nature of Plateau Yuman culture, the data are meager, vague, and are often inconsistent even in respect to the essentials.[4]

SUB-AREAS OF NAVAHO POTTERY MAKING

A comparison of the ceramic techniques employed by the various Navaho sub-groups, geographically considered, reveals one fact quite clearly: namely that whereas a high degree of resemblance obtains among the Central, Eastern and Ramah Navaho groups, these three share far fewer elements with the Western Navaho. The Central group, as indeed might have been predicted, resembles the Western Navaho somewhat more than do the Eastern and Ramah groups, in that the former two groups share the pit for firing vessels and lack the use of the stone ring in firing.

Following Hill's conclusions, the regional differences of Navaho pottery making may be summarized as follows:[5] whereas decorative fillets were appliquéd to the necks of cooking vessels in the Central, Eastern and Ramah areas, in the west the last fillet added during construction was made larger to serve as a basis for decoration. In the Central, Eastern and Ramah regions, dippers were modelled, while in the west they were constructed with a combination of filleting and modelling. While vessels in the Central, Eastern and Ramah areas were slipped and painted, the painting of pottery vessels did not occur among the Western Navaho. In the west, all vessels were fired with wood fuel alone, and in a pit kiln; whereas the pit kiln occurred sporadically in the Central and Ramah regions, it was the exception rather than the rule. In the Central, Eastern, and Ramah areas, vessels were fired on the ground surface; cooking pots were burned with wood, while manure was used for painted vessels. In the Eastern and Ramah areas, the stone circle was used in firing.

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[1] The comparative table has been eliminated here in order to save the expensive type-setting. It is, however, on file in the Peabody Museum of Harvard University.

[2] While the comparative value of design and shape is not denied, these criteria were omitted in the present study because of the inadequacy of the series of Navaho vessels and because of the classificatory difficulties involved in handling design and vessel shape objectively.

[3] The following lists the sources consulted for the element list: Eastern Pueblos: *San Ildefonso* (Guthe, 1925); *Santo Domingo* (Chapman, 1936, pp. 10–15). Western Pueblos: *Hopi* (Colton, 1931, pp. 1–4; 1938, pp. 6–11; Curtis, 1922, pp. 25–27; Stephen, 1936, pp. 130, 481–483, 1187–1190; Hough, 1919, pp. 272–275); *Zuni* (Cushing, 1920, pp. 310–316; Stevenson, 1883, pp. 328–334; Stevenson, 1904, pp. 373–377). *Pima* (Russell, 1908, pp. 124–131). *Maricopa* (Rogers, 1936, pp. 34–35; Spier, 1933, pp. 104–110). *Yuma* (Rogers, 1936, pp. 30–34). *Southern Diegueño* (Rogers, 1936, pp. 5–15). *Western Navaho* (Gifford, unpublished notes; Hill, 1937). *Central Navaho* (Franciscan Fathers, 1910, pp. 285–289; Hill, 1937; Palmer, unpublished manuscript; Sapir and Sandoval, 1930, pp. 575–576). *Eastern Navaho* (Gifford, unpublished notes; Hill, 1937; James, 1937, p. 85). *Ramah Navaho* (data compiled from field notes of Tschopik and Kluckhohn).

[4] Plateau Yuman pottery manufacture has been described by the following: *Havasupai* (Spier, 1928, pp. 138–140); *Walapai* (Mook, 1935, pp. 86–90); *Yavapai* (Corbusier, 1886, p. 284; Gifford, 1932, p. 220; 1936, pp. 280–281). Also see Rogers, 1936, pp. 39–41.

[5] Hill, 1937, p. 22.

The position of the Ramah Navaho with reference to the other three groups is very interesting. Although the affiliations of this area are primarily with the Central and Eastern regions, the Ramah Navaho potters are noteworthy chiefly for the diversity of techniques employed by them. Every method of firing, for example, which is to be found from the Eastern Navaho to the Western is encountered also in the Ramah area. In addition, the dome-shaped manure kiln was employed, a trait almost certainly due to Zuñi influence, since it is not shared by any other Navaho group.

The history of the Ramah community furnishes several clues as to the cause of this technical diversity in pottery making. Genealogics indicate that the population was originally drawn from several discrete regions of the Navaho Reservation. The sojourn at Bosque Redondo may have had additional positive effects on the diffusion of ideas. Finally, the geographical proximity of Zuñi pueblo has undoubtedly served to influence Ramah Navaho potters.[6]

Since it seems clear that regional differences in Navaho pottery making do exist, it may prove profitable to examine briefly the painted Navaho vessels which exist today in various museum collections and elsewhere, in an attempt to pin down these styles geographically.[7] It is indeed unfortunate that so few of the specimens are accompanied by adequate documentation; in most cases, the state alone in which the specimen was collected is given. If, however, one may judge from the photographs and the brief—and in general, it is realized—inadequate descriptions which accompany them, at least four pottery styles seem to be represented.

The first style is apparently to be located in northwestern New Mexico, in the vicinity of Chaco Canyon, Nava, and Red Rock; that is to say, at the juncture of the Eastern and Central areas.[8] This style seems to be characterized by an orange to buff, lusterless ground painted in dark red-brown. A second style—which may in fact be a variant of the first, but seems distinctive in paint and design—is possibly to be located somewhat to the south of the region designated above, again at the junction of the Eastern and Central areas. This style[9] is characterized by a lusterless orange-buff ground, painted in thin matte black, or with matte black and brick-red. The third style seems to be located in the Central area in the vicinity of Canyons del Muerto and de Chelly.[10] This ware is characterized, apparently, by a highly polished orange to red-brown surface which is painted in a very thin matte black. A fourth style, possibly related to the third, seems to be centered in the Carriso Mountain region of northeastern Arizona, again in the Central area.[11] This ware possesses a dull, brick-red surface which is painted in matte black.

The foregoing account, which is necessarily of a highly speculative nature and—the writer fears—of little actual value, has been presented with the hope that it may aid the archaeologist in the localization of some Navaho wares. For in the last analysis, the subdivision of Navaho ceramics must rest upon archaeological research.

In spite of minor regional diversities, one fact, which has been stressed throughout, stands out clearly: the basic stylistic dichotomy of Navaho pottery. The cooking and painted vessels differed in respect to shape, method of decoration, use, and finally in the names and terms applied to the two wares. The question is, does this fact suggest separate historical origins?

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[6] The Ramah Navaho potters shared with Zuñi a specific canteen shape (pl. IX, e, e′). In addition, the animal motif in fig. 5, a, is strongly reminiscent of the familiar Zuñi deer design. See Bunzel, 1929, pl. IX, top.

[7] See pls. IX–XV. Additional specimens are said to occur in the collections of the Laboratory of Anthropology at Santa Fé. The following list of painted Navaho vessels in the Brooklyn Museum was kindly supplied by Dr. Spinden. Collected by S. Culin, 1903: 3783–3786, dipper; 3787–3797, bowl; 3798, bowl; 3799, bowl; 3800, bowl; 3801–3803, jar; 3804, bowl; 3805–3810, pot. Collected in Canyon del Muerto: 3867–3872, bowl; 3873, jar; 3874–3877, pot.

[8] See pls. IX, a, c; XI, d, d′, e; XIII, b, b′; XIV, a; XV, a, b, f.

[9] See pls. X, c; XI, g; XV, c, g.

[10] See pl. X, a, b.

[11] See pl. XII, a, a′, c, e, g.

The techniques of construction (which are the same for both wares) are virtually identical from the Eastern Navaho to the Western. Raised neck ornamentation is everywhere present, and cooking vessels are consistently pitch-covered. The central tendency in utility ware shape seems to have been uniform from east to west.

Painted ware, on the other hand, was confined to the Eastern, Central, and Ramah regions. Whereas red slip alone was used in the West, the Eastern, Central, and Ramah groups employed in addition yellow and white slips.

To sum up the foregoing, then, the cooking ware may be said to have been widely distributed and of a remarkably homogeneous nature; coupled with this—a fact which has been stressed again and again—is the unusual character of this ware with reference to other Southwestern pottery types. On the other hand, the painted ware was restricted in distribution and—judging from available genealogies—was never so widely made. Finally, vessels in museum collections indicate that the painted Navaho pottery was not so homogeneous, and indeed that there were several local styles. We may, therefore, conclude with Hill that the cooking ware is probably older and more basic in Navaho culture; the painted ware more recent.[12] Linguistic evidence, it has been suggested, seems to bear out these distributional findings. We may postulate separate origins, then, for these two wares in point of time, if not in place.

THE AFFINITIES OF NAVAHO PAINTED POTTERY

Ignoring for the present the affiliations of Navaho utility ware, we must now attempt to discover, by comparative methods, the probable historical affinities of Navaho painted pottery. The latter ware seems not to have been present to the north of the immediate sphere of Pueblo influence. Nor are we able here to entertain the possibility that the painting of pottery was invented independently by the Navaho in an area in which the tradition of painted pottery attains a respectable antiquity. This trait, therefore, must have been taken over by the Navaho from some painted pottery-making group within the limits of the Southwest as these are generally conceived.

Let us first turn our attention to the Eastern, Central, and Ramah Navaho; for it has been demonstrated that there is some justification for treating these groups as a unit.[13] In an attempt to discover by which Southwestern group these Navaho were most strongly influenced in respect to their painted pottery, the Pueblos may be selected first as primary suspects.

The first significant point which emerges is the fact that the E-C-R Navaho resemble all Pueblos here considered more than they resemble any Yuman-Piman group. Among important E-C-R Navaho resemblances to Pueblo may be mentioned the following: clay ground on metate; clay not winnowed (except at San Ildefonso); base of vessels formed with the hands; non-use of paddle and anvil; use of scraping tools; practice of scraping the vessel while wet; use of polishing tools; use of buff and/or white slip; vessels painted before firing; yucca leaf paint brush; vessels fired on ground surface; use of manure fuel; vessels inverted in firing. The ceramic technology of the Yuman and Piman peoples here considered (with the exception of the Maricopa) appears to differ significantly from the E-C-R Navaho-Pueblo tradition in the following items:[14] use of the mortar for grinding clay; clay regularly winnowed; "souring" of the paste;[15] forming base of vessel over inverted pot; shaping with paddle and anvil; absence of scraping tools; absence of polishing tools (except Pima); absence of buff or white slip (red slip is represented only among the Pima and

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[12] Hill, 1937, pp. 22–23.

[13] This unit will be referred to as "E-C-R Navaho."

[14] The position of Maricopa and also of Piman ceramics is not at all clear at the present time, and for the latter group the existing literature is inadequate. Apparently pottery making among these groups attained a higher degree of development than may be said to be true of other Yuman-speaking peoples, which has resulted in a rather higher degree of resemblance of Maricopa and Pima pottery technology to Pueblo. This tends to bear out the statements of Roberts and Gifford to the effect that the use or non-use of the paddle and anvil as a shaping device is, after all, not necessarily in itself of primary significance in a judgment of ceramic relationships. Roberts, 1935, p. 20; Gifford, 1935, p. 535.

[15] The Pima (Russell, 1908, p. 126) and the Maricopa (Spier, 1933, pp. 106–107) mix the paste and allow it to stand over night. The Yuman (Rogers, 1936, pp. 30–31) and Southern Diegueño (Rogers, 1936, p. 8) make the paste into pats and bury it in wet ground to "ripen."

Maricopa); vessels painted after firing (except Southern Diegueño); use of stick or fiber cord paint brush; vessels fired in pit; wood fuel for all vessels; vessels placed upright during firing (except Pima).

In the total number of shared technological items, the E-C-R Navaho in general resemble the Western Pueblos to approximately the same degree to which the latter resemble the Eastern Pueblos.[16] Generally, there appears to be a somewhat greater degree of similarity between the E-C-R Navaho and the Western Pueblos than between these Navaho and Eastern Pueblos. This similarity is brought out in the following shared elements: lack of winnowing; use of sherd temper (the Hopi and Zuñi in addition use sand temper, while at San Ildefonso and Santo Domingo sand is used exclusively); the modelling of the base of a vessel with the fingers (the base is patted between the palms at San Ildefonso and Santo Domingo); the use of yellow paint; the use of a vegetable medium for paints;[17] the firing of vessels in a stone ring.[18] Of specific E-C-R Navaho-Eastern Pueblo resemblances, the writer could find only three, and one of these is negative: the non-use of spiral coiling in building vessels;[19] the use of corn cob scrapers (not mentioned for Santo Domingo, but apparently absent at Hopi and Zuñi); the use of a vegetable black paint pigment.[20]

Whereas the resemblances in pottery technology among the E-C-R Navaho and the Pueblos are marked, certain features characteristic of all Pueblos here considered are lacking among these Navaho sub-groups: the use of sand temper; use of the puki;[21] use of potsherd and/or stone scrapers; practice of scraping the vessels after they are dried; application of slip by means of a mop; practice of mixing paints with water alone; and probably the practice of protecting vessels during the firing.[22] On the other hand, but two traits which are shared by the E-C-R Navaho are lacking among the Pueblos: the practice of slipping the vessels by hand, and that of heaping the fuel over the vessels directly during the firing. Although both the Hopi and Zuñi mix some paints with vegetable juice, this technique is characteristic of all Navaho pottery paints, and in the Ramah area is used also for slips. It is interesting to note that this same method of preparing paint is employed by the Navaho in the painting of ceremonial paraphernalia.[23]

It is now necessary to inquire briefly into the position of the Western Navaho for, as it has been demonstrated above, this group appears to be significantly different from the Eastern, Central, and Ramah Navaho. It has been stated in addition that the techniques of pottery construction were virtually identical from the Eastern Navaho to the Western, but that painted ware was not made by the latter group. Some items, however, which may be said to characterize the Western Navaho are undoubtedly affiliated with groups farther to the west: the use of red slip alone; slip applied by hand, firing in a pit; and the use of wood fuel for all wares. In fact it is not unlikely that a rather high degree of similarity prevailed between Western Navaho slipped ware and Yavapai pottery.[24] It is impossible, however, at present to discover the nature of this relationship if, indeed, such existed.

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[16] Throughout this section, the term "Western Pueblos" refers to the Hopi and Zuñi, while the term "Eastern Pueblos" includes San Ildefonso and Santo Domingo.

The multiplicity of items found at the Hopi villages (painted pottery is now made only on First Mesa) is possibly to be interpreted as due to the influence of the Tewa-speaking village of Hano. This is suggested by the fact that the Hopi share certain items with the Rio Grande villages which seem to be absent at Zuñi (modelling the base of pottery between the hands; constructing the fuel kiln by placing the manure slabs vertically, on end).

[17] By "vegetable medium for pigment" is meant the practice of employing some plant juice or gum as an adhesive for the paint as opposed to mixing the pigment with a water medium alone. At Zuñi, all paints are mixed with water to which the syrup of yucca fruit has been added. Stevenson, 1904, p. 375.

[18] The Hopi occasionally fire vessels in a stone ring or in a ring of sand. Stephen, 1936, pp. 282, 1189.

[19] References to spiral coiling at Zuñi and Hopi are to be found in the following: Cushing, 1920, p. 311; Stephen, 1936, p. 1188; Hough, 1919, p. 273.

[20] At San Ildefonso (Guthe, 1925, pp. 25–26) and at Santo Domingo (Chapman, 1936, p. 12) a boiled mixture of guaco or Rocky Mountain bee plant (*Peritoma serrulatum*) and water is used to produce a black pigment. The Eastern and Central Navaho (Hill, 1937, pp. 18–19) employ "coal" and yucca juice.

A mineral pigment is here defined as one which has as a principal ingredient some inorganic substance. At Zuñi, according to Stevenson (1904, p. 375), water from boiled guaco is mixed with a manganiferous clay; following Cushing (1920, p. 314) hematite with a sizing of prairie dog urine or the syrup of yucca fruit is used. Of the Hopi, Hough (1919, p. 273) states that ironstone and tansy mustard oil is employed, while Mrs. Colton (1938, p. 8) states that liquid from boiled tansy mustard or yucca juice mixed with ground hematite is used.

[21] A "puki" is a mold in which the base of the growing vessel is placed, and which holds the vessel during its construction. Guthe, 1925, p. 27.

[22] At San Ildefonso, tin cans and bricks prevent the burning manure from coming into contact with the vessels (Guthe, 1925, p. 71). The potters of Santo Domingo pueblo formerly covered vessels during the firing with large sherds, but now use sheet iron (Chapman, 1936, p. 14). The Hopi protect the vessels with large sherds (Stephen, 1936, p. 482).

[23] Matthews describes this in connection with the painting of prayer-sticks and cane cigarette offerings for the Night Chant. Here a yucca leaf brush is employed, and yucca leaf sections are used as paint containers (1902, pp. 38–40). The same techniques are used, according to Hill, in painting the deer disguise employed in ritual hunting (1938, pp. 123–124).

To sum up the foregoing, several conclusions seem evident. First, Pueblo pottery manufacture is not to be considered everywhere uniform in regard to all technological detail; there seems to be a greater resemblance between the Zuñi and the Hopi in regard to these than between either group and the two Rio Grande Pueblos here considered. Second, the painted pottery of the Central, Eastern, and Ramah Navaho is, beyond all reasonable doubt, attributable to Pueblo influence; these influences, from the evidence at hand, are possibly to be assigned, in the main, to the Western Pueblos. Third, there is but slight resemblance between Navaho painted pottery and that manufactured by the Yuman- and Piman-speaking peoples. Finally, the position of the Western Navaho is not at present clear, although some degree of relationship to groups farther to the west is suspected. In view of this suspicion, we are unable at present to conclude with Hill that there were two waves of Pueblo influence, the first introducing slipped ware to the Navaho and the second the concept of painted decoration.[25] Nor has it yet been demonstrated conclusively that "such regional variations as occur in Navaho pottery-making technique generally bear the stamp of a peculiarity of the nearest Pueblo."[26] In short, whereas the present technological evidence seems to indicate the Western Pueblos as the source from which the Navaho learned to make painted pottery, the determination of specific relationship must of necessity rest ultimately upon archaeological research.[27]

Since available evidence appears to indicate conclusively that the inspiration of Navaho painted pottery may be attributed to Pueblo peoples, it would seem important to inquire into the types of contacts which may have bearing upon this diffusion. It is obvious that such an inquiry must necessarily be treated here in a most summary fashion, since this important problem would comprise a sizable study in itself.

Undoubtedly one of the most important factors which has operated to expose Navaho culture to Pueblo ideas has been intermarriage and the related phenomenon, the introduction of Pueblo clans. Reichard has treated the subject of the introduction of foreign clans among the Navaho, notably from Zuñi, Hopi, and Jemez, at some length.[28] This matter has also been dealt with by the Franciscan Fathers[29] and by Hodge.[30] Stephen speaks of Navaho marriage with Hopi women (and the practice of kidnaping them during raids),[31] while there has been at least one case, Dr. Kluckhohn informs me, of Zuñi intermarriage with a Ramah Navaho.

A second important opportunity for diffusion is furnished by trading relationships.[32] Again, Navaho attendance at Pueblo dances has been noted by Stephen and Cushing.[33] Factors which are no longer operative, but which must have been important in former times were those of warfare and slavery. Reiter states that during the Pueblo revolt of 1696, the Jemez fled to the wes tand banded themselves with the Navaho, Zuñi, and Acoma.[34] Dyk mentions an instance when a Navaho bought a Zuñi woman and her children as slaves.[35] In the Two Wells-Ramah areas, additional opportunities for Pueblo contact are available. Several Navaho from this area herd sheep for the Zuñi, while others are silversmiths within the pueblo itself.

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[24] Although the accounts are conflicting, it seems evident, as pointed out by Rogers, that several aspects of Yavapai pottery manufacture were (if there is any justification in such a generalization) non-Yuman (1936, pp. 40–41). Among these non-Yuman items (in the case of the southeastern Yavapai) may be included the non-use of the paddle and anvil, use of sherd scrapers, bottom of vessel coiled. Gifford, 1932, p. 220.

[25] Hill, 1937, pp. 22–23.

[26] Hill, 1937, p. 7.

[27] Since these pages were written, an article by R. L. Malcolm has appeared which deals with archaeological remains, putatively Navaho, from Chaco Canyon, New Mexico. In hogan sites which seem to date from the 18th century, sherds of both Navaho painted and utility wares were found associated with sherds of Ashiwi and Ogapoge Polychromes. The former Pueblo ware was widespread throughout the Little Colorado area during the 18th century while the latter is described as an Upper Rio Grande ware of the same date (1939, pp. 12–15).

[28] Reichard, 1928, pp. 11–19.

[29] Franciscan Fathers, 1910, pp. 425–426.

[30] Hodge points out that the Navaho origin legends speak of the adoption of certain foreign clans, among these one Keresan, one Tanoan (with which, it is said, some Zuñi were affiliated), and one from Jemez. One of these adopted clans, he states, contained women who were potters and basket-makers (1895, pp. 227–228).

[31] Stephen, 1936, p. 948.

[32] Navaho trade at Jemez has been mentioned by Parsons, 1925, pp. 16–17; at Zuñi by Cushing, 1920, pp. 528–534, and by the Franciscan Fathers, 1910, pp. 300–301; and at Hopi by Dyk, 1938, pp. 137, 150, 217, 289–290, and by Stephen, 1936, pp. 955, 1016.

There have been adequate opportunities, therefore, for the diffusion of technological knowledge of painted pottery to the Navaho; we must now inquire briefly into the modifications which were invoked during the course of this borrowing. A glance at the plates illustrating Navaho painted pottery vessels serves to indicate that the diffusion was accompanied by change in respect to both shape and design. For, with the possible exception of the canteen, the dipper, and certain bowl forms, Navaho painted pottery shapes seem not typically Pueblo.[36] Where, then, are we to find the prototypes of Navaho painted vessel shapes? Although this question may not be answered conclusively at this time, it may not be mere coincidence that the pitch-covered Navaho basket, which shares the characteristic painted pottery water bottle shape, functioned formerly in the capacity of a water container and was called by the same linguistic term.

The problem of modification in design coincident upon the borrowing of painted pottery must await more extensive series of Navaho vessels. Although no documentation is offered, the designs appearing on Navaho pottery give the impression of being unlike familiar Pueblo motifs.

All things considered, one feels that here in the case of Navaho painted pottery, we are dealing with a young craft which became obsolete while yet in the process of adjustment through the impact of European material culture. The present study can claim to have established the following: (1) the diversity of the technological patterns which characterize Navaho ceramics; (2) the affiliations of some of these patterns with Pueblo culture, of others with groups to the west, and of still others with groups and regions at present unknown; (3) the changes and adaptations which accompanied the borrowing of a foreign pottery style. The questions arising, however, out of the origin, growth, and decline of Navaho pottery making are problems which rest ultimately with the archaeologist.

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[33] Stephen, 1936, pp. 385, 437. Cushing, 1920, p. 608. Dr. Kluckhohn informs me that many Ramah Navaho regularly attend the Shalako at Zuñi.

[34] Reiter, 1938, pt. I, p. 38. See also Cushing, 1920, pp. 197, 526; Hill, 1936a, pp. 3–6.

[35] Dyk, 1938, p. 217.

[36] For illustrations of representative Pueblo vessel shapes, see Bunzel, 1929, p. 9, pl. I; Chapman, 1936, p. 7, fig. 4; p. 8, fig. 5; Kidder and Shepard, 1936, p. 251, fig. 222; p. 330, fig. 273. Stevenson illustrates gourd-shaped ladles from Zuñi (1883, figs. 437, 439, 440, 441).

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PLATES

NOTES ON PLATES VIII TO XV

Plate VIII. Navaho painted vessels in the Peabody Museum, Harvard University.

a. 38–55–10/12955. Bowl manufactured by informant 36. Height 4 cm., diameter 9.8 cm. Painted after firing. Slipped chalk white inside and out. Exterior designs in matte black. Lip of rim painted dark red. Bottom mustard yellow, outlined in dark red. Surface rough, without luster.

b. 38–55–10/12960. Bowl manufactured by informant 32. Height 7.7 cm., diameter 15 cm. Undulating rim; vessel lopsided. Vessel described in the text. Badly over-fired.

c. 38–55–10/12968. Bowl manufactured by informant 32. Height 9.6 cm., diameter 15.8 cm. Undulating rim. Vessel described in text. Badly over-fired to the extent that the design rubs off.

Plate IX. Navaho painted and cooking vessels in the Peabody Museum, Harvard University.

a. 57159. Water bottle collected by F. W. Putnam at Pueblo Bonito, Chaco Canyon, New Mexico, in 1901. Height 15 cm. Orange-buff painted in red-brown to dark brown. Surface luster dull. Scraped, but apparently not polished. Considerable fire clouding.

b. Vessel purchased from informant 192. Height 14.5 cm. Paste buff, slipped on exterior with chalk white slip. Painted in red-brown, outlined in red-brown to dark brown. Exterior surface of medium luster. Scraped and stone-polished. Surface spalled and fire clouded. 39–35–10/1893

c. 57157. Bowl collected by F. W. Putnam at Pueblo Bonito, Chaco Canyon, New Mexico, in 1901. Height 11.5–12 cm., diameter 21.5–22 cm. Red-orange to orange-buff, painted inside and out in dark red-brown. Surface luster medium. Scraped and stone-polished. Exterior surface finely crazed. Moderate fire clouding.

d. Bowl manufactured by informant 14. Height 6.2 cm., diameter 16 cm. Undulating rim. Originally slipped white inside, yellow outside. Surface luster moderate. Scraped and stone-polished. Surface covered with slight depressions. Fire clouding has completely obliterated slip color. Vessel broken in firing. 38–55–10/12957

e,e′. Canteen purchased from informant 192. Height 24 cm. Slipped yellow-buff, unpainted. Scraped and stone-polished. Surface lustrous, covered with small depressions. Small fire clouds; badly spalled on one surface. 39–35–10/18392

f. Cooking pot made by informant 32. Height 16.5 cm. Heavily coated with piñon gum. 38–55–10/12959

g. Cooking pot owned by informant 32. Height 17 cm. Rim notched to indicate the "doorway."

h. Old cooking pot found in Ramah-Atarque region, New Mexico. Height 36 cm.

i. 86156. Cooking pot from Tiz-na-zin, New Mexico, collected by G. W. Bryan in 1914. Height 23 cm.

Plate X. Navaho painted vessels in the American Museum of Natural History, New York.

a. 29–1/8713. Olla purchased by E. H. Morris at Canyon de Chelly, Arizona. Height, 30 cm. Bright orange to grayish-orange, painted in thin black. Dark red-brown stripe around rim. Lustrous surface. Scraped and stone-polished. Considerable fire clouding.

b. 29–1/8732. Bowl found by E. H. Morris in a Navaho cache in Battle Cave (?), Canyon del Muerto, Apache Co., Arizona. Diameter 23.1–26.7 cm. Hemispherical profile, asymmetrical. Dark red-orange, painted in thin matte black. Exterior undecorated. Surface dull in luster. Scraped and stone polished.

c. 29–0/355. Pitcher collected by G. H. Pepper in Arizona in 1904. Height 28 cm. Single handle. Buff-orange to gray, painted in thin matte black. Surface luster dull. Scraped and stone-polished. Considerable fire clouding.

d,d′. 29–0/360. Bowl collected by G. H. Pepper in Arizona in 1904. Diameter 20.8–20.9 cm. Rim undulating. Exterior cream-buff, interior slipped chalk white. Painted inside and out in a red-brown of uneven intensity. Designs outlined in darker brown. Surface luster dull. Exterior scraped and stone-polished; slip not polished. Slip finely crazed. Fire clouded on exterior.

Plate XI. Navaho painted vessels in the Museum of the American Indian, Heye Foundation, New York.

a. 5/2690. Olla collected by G. H. Pepper in New Mexico. Height 21.5 cm. Concave bottom.

Orange-buff, painted in red-brown. Designs outlined in dark red-brown. Surface luster dull.

b. 5/2736. Pitcher collected by G. H. Pepper in New Mexico. Height 20.3 cm. Single handle. Orange-buff, painted in matte black. Raised fillet with punctations around neck. Surface texture coarse. Scraped and stone-polished.

c. 5/2650. Small olla collected by G. H. Pepper in New Mexico. Height 17.2 cm. Two small horizontal strap handles. Buff to brick red, painted in matte black. Surface luster dull. Stone-polished.

d,d′. 5/2653. Water bottle collected by G. H. Pepper in New Mexico. Height 24 cm. Two vertical handles. Buff, decorated in red-brown. Surface luster dull. Scraped and stone-polished. Considerable fire clouding.

e. 5/2652. Water bottle collected by G. H. Pepper in New Mexico. Height 19.6 cm. Two vertical handles. Orange-buff, decorated in red-brown. Surface luster dull. Scraped, but not polished. Considerable fire clouding.

f. 5/2686. Olla collected by G. H. Pepper in New Mexico. Height 16.5 cm. Brick red, decorated inside and out in matte black. Surface luster dull. Scraped and stone-polished.

g. 6/198. Bowl collected in New Mexico. Diameter 22.8 cm., height 8.2 cm. Orange-buff, painted in brick red. Designs outlined in brownish black. Exterior not decorated. Surface luster dull. Considerable spalling and fire clouding on exterior. Stone-polished.

h,h′. 5/2735. Bowl collected by G. H. Pepper in New Mexico. Diameter 13.9 cm., height 6.3 cm. Orange, decorated in red-brown. Bottom painted red. Surface crazed.

Plate XII. Navaho painted vessels from the Carriso Mountains, Arizona, in the L. T. MacKinney collection, Chaco Canyon, New Mexico.

a,a′. Bowl. Height 9.5 cm., diameter 19.5 cm. Brick-red, decorated inside and out in matte black. Surface luster dull to medium. Scraped and stone-polished. Considerable fire clouding on exterior.

b. Eccentric bowl. Height 6 cm., diameter 14 cm. Buff-yellow, painted inside and out in red-brown. Scraped and stone-polished.

c. Bowl. Brick-red, decorated inside and out in matte black. Surface luster medium. Scraped and stone polished.

d. Olla. Height 12 cm., diameter 19 cm. Buff-yellow, decorated on exterior in matte black. Surface luster medium. Scraped and stone-polished. Considerable fire clouding.

e. Cup. Height 7.5 cm., diameter 13.5 cm. Brick-red, painted inside and out in matte black. Surface luster dull. Scraped, but apparently not polished. Considerable fire clouding.

f,f′. Bowl. Height 13 cm., diameter 28 cm. Buff-orange, decorated in dark red-brown. Surface luster medium. Scraped and stone-polished. Surface crazed. Considerable fire clouding on exterior.

g. Bowl. Data lacking.

Plate XIII. Navaho painted vessels in the William Evans collection, Shiprock, New Mexico.

Descriptive material in regard to these vessels is, unfortunately, lacking. The pottery was made by Mrs. Tallman, who lives at Red Rock, Arizona, some fifty miles southwest of Shiprock.

Plate XIV. Navaho painted vessels in the Denver Art Museum, the Taylor Museum, and the Arizona State Museum.

a. Water bottle. Denver Art Museum. Collected about 1885. Height 25 cm. Buff to red-brown, decorated in dark red-brown.

b. Cup. Denver Art Museum, Douglas collection. Height 6.9 cm., diameter 10 cm.

c. Water bottle. Denver Art Museum. Collected about 1900. Height 25 cm. Buff to red-brown, decorated in dark red-brown.

d,d′. Bowl. Denver Art Museum. L36–1030. Collected about 1885. Height 9.5 cm., diameter 22.8 cm. Orange-buff, painted in red-brown. Designs outlined in dark red-brown.

e,e′. Bowl. Taylor Museum, Colorado Springs.

f. Bowl. Arizona State Museum, Tucson. Bowl made at Chinlee, Arizona. Height 11.3 cm., diameter 22.8 cm. Hemispherical; undulating rim. Paste light brown, sherd tempered. Exterior buff, bottom painted red-brown. Interior buff, decorated in red-brown, outlined in thin matte black. Medium luster. Moderate fire clouding on exterior.

Plate XV. Navaho painted vessels in the Museum of Anthropology, University of California.

a. 2–8350. Pitcher collected in New Mexico in 1903. Height 19.2 cm. Gray-buff, painted in dark brown. Surface luster dull. Fire clouded.

b. 2–8349. Water bottle collected in New Mexico in 1903. Height 28 cm. Gray-buff, painted in dark brown. Surface luster dull. Fire clouded.

c. 2–8348. Water bottle collected in New Mexico in 1903. Height 26 cm. Orange-buff, painted in matte black. Surface luster dull. Stone-polished. Fire clouded.

d. 2–8347. Water bottle collected in New Mexico in 1903. Height 30 cm. Brown, painted in dark brown. Surface luster dull. Stone-polished. Fire clouded.

e. 2–8353. Bowl collected in New Mexico in 1903. Height 9.5 cm., diameter 25.3 cm. Yellow buff, painted in matte black. Interior lustrous; exterior dull. Stone-polished.

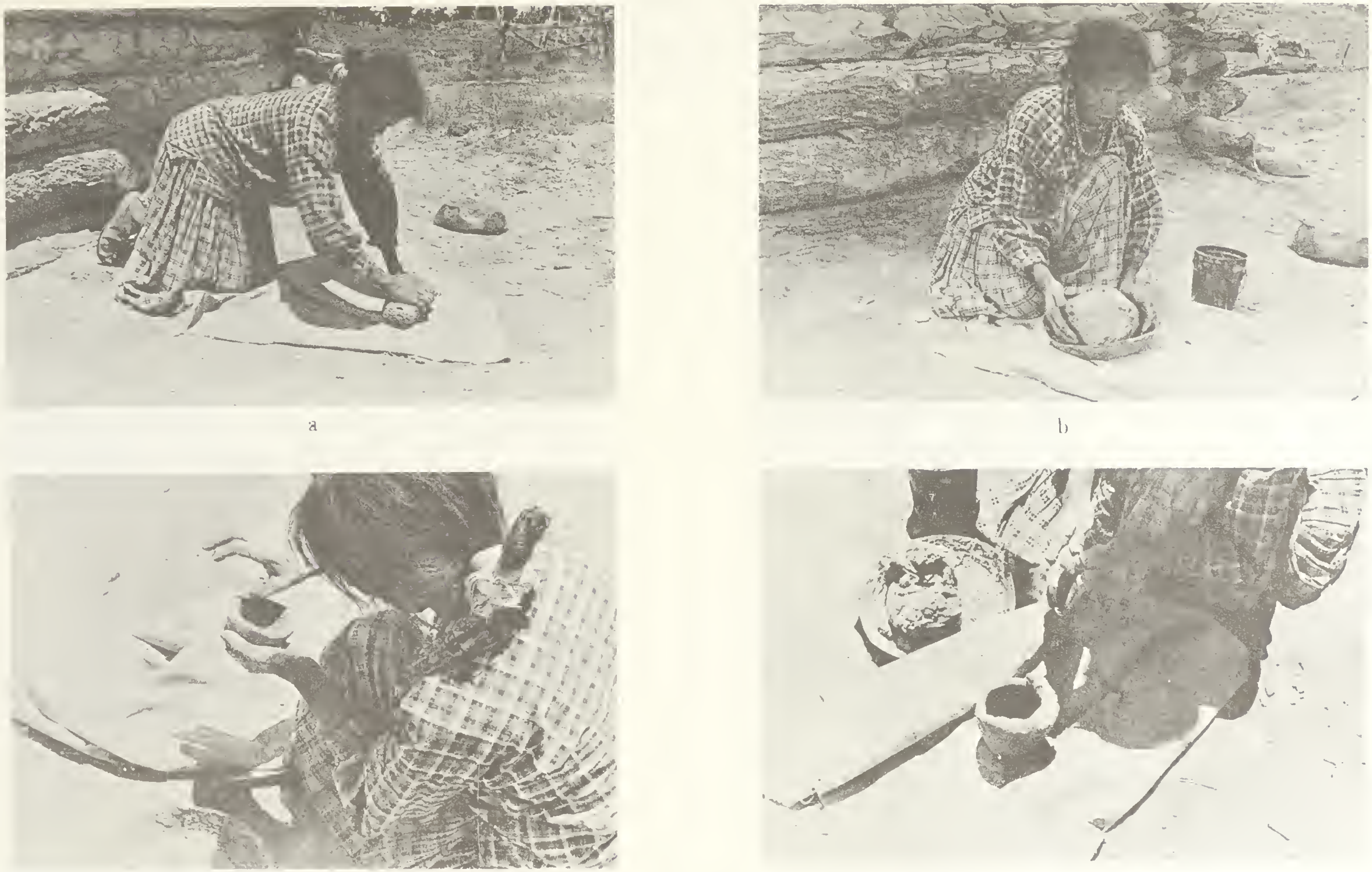
f. 8355. Bowl collected in New Mexico in 1903. Height 7.4 cm., diameter 17.5 cm. Pinkish, painted in dark brown. Stone-polished. Fire clouded.

g. 2–8354. Bowl collected in New Mexico in 1903. Height 8.6 cm., diameter 22.5 cm. Pinkish, painted in dark brown. Designs outlined in brownish-black. Surface texture smooth. Medium luster. Stone-polished. Fire clouded on exterior.

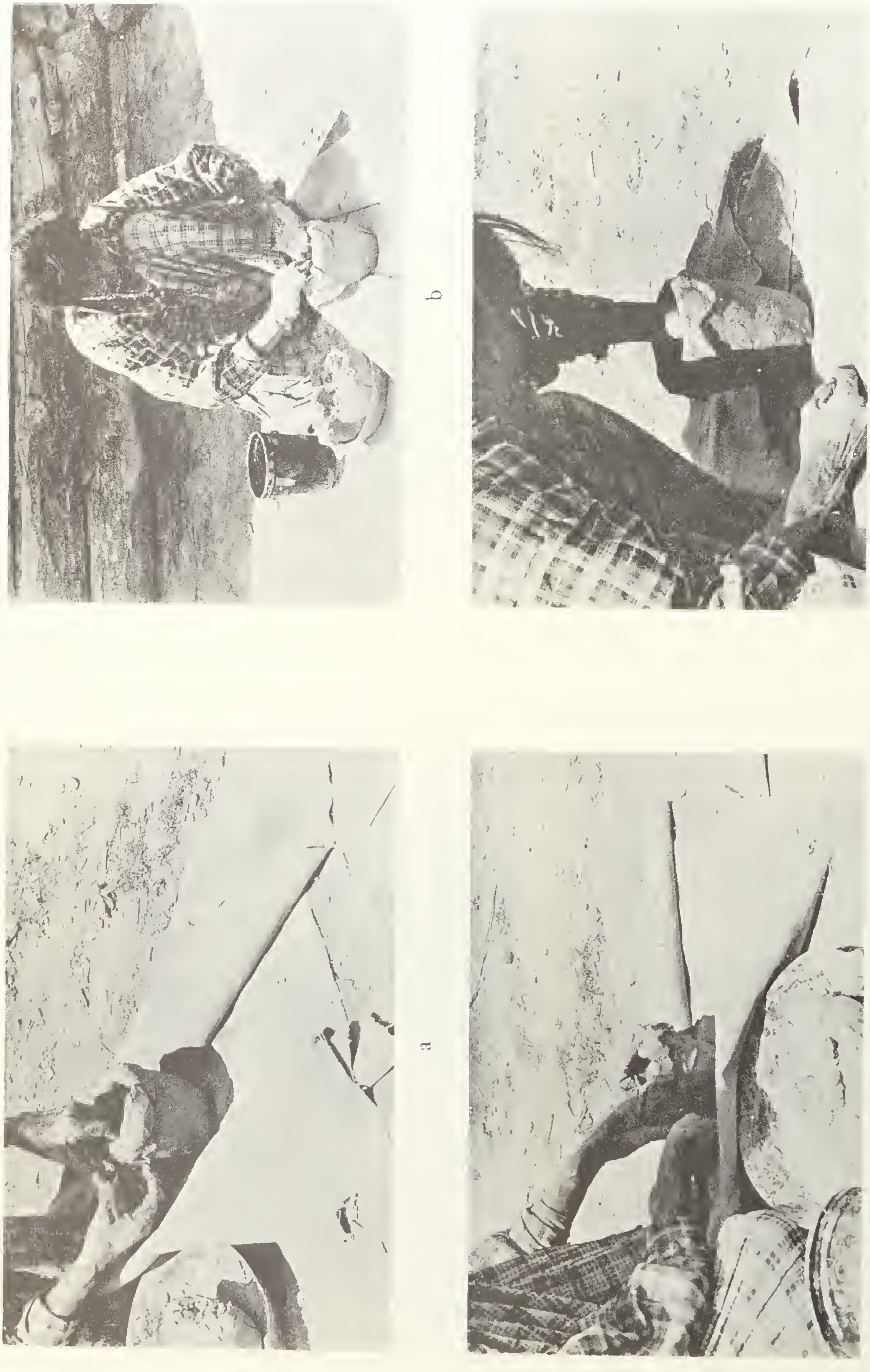
h. 8356. Bowl collected in New Mexico in 1903. Height 6.8 cm., diameter 15.8 cm. Pinkish, color of paint not clear. Surface texture rough. Stone-polished. Fire clouded.

i. 2–15159. Bowl collected at Back Star, New Mexico, in 1935. Height 10 cm., diameter 20.9 cm. Orange-buff, painted in red, probably after firing. Surface texture smooth. Medium luster. Stone-polished. Small fire clouds.

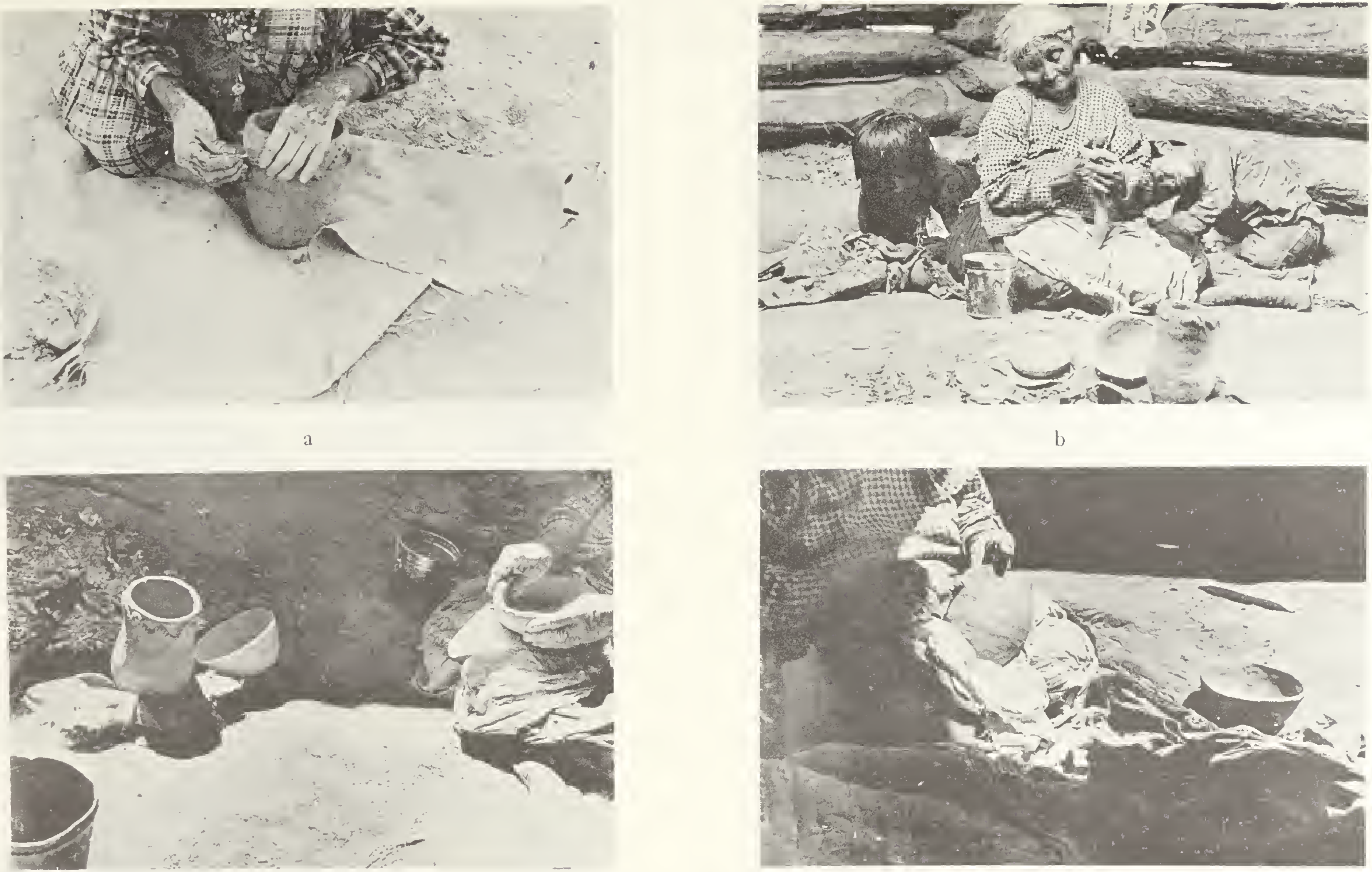
j. 2–8357. Ladle collected in New Mexico in 1903. Height 4.2 cm., length 15 cm. Pinkish-buff, decorated in matte black. Surface rough. Stone-polishing absent.



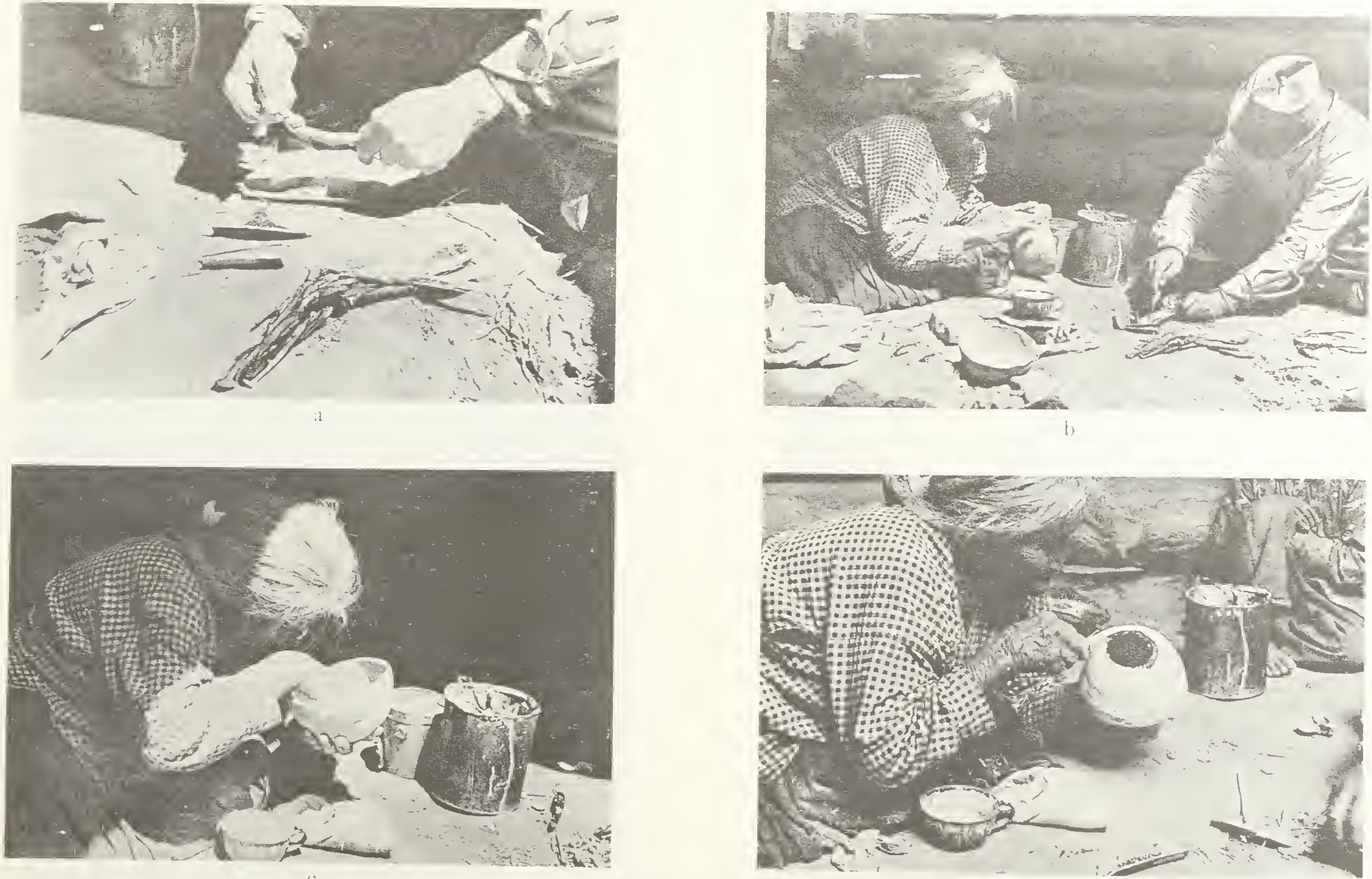
I. Preparation of the paste and construction (15).
a. Grinding the clay.
b. Kneading the paste.
c. Smoothing the rim of base.
d. Rolling a fillet of paste.



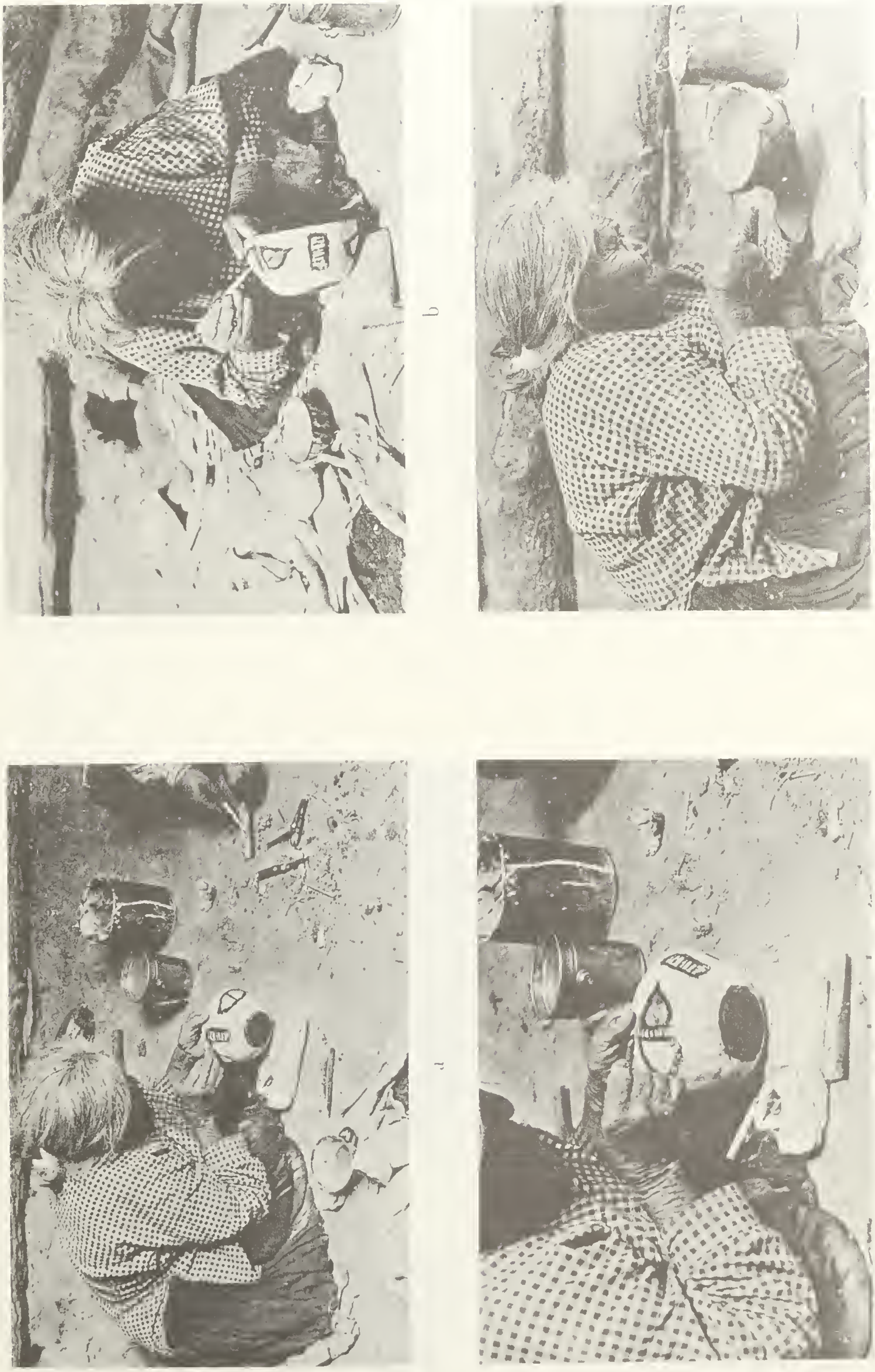
II. Construction (15).
a. Adding fillet to the base.
b, c. Obliterating fillet juncture.
d. Smoothing inside of vessel.



III. Construction and drying.
a. Adding punctations to decorative band (15).
b. Rolling fillet of paste (32).
c. Vessels drying by fire pit (32).
d. Scraping with corn cob (32).



IV. Slipping and painting.
a. Squeezing yucca juice for paint (24).
b. Slipping bowl (32) and mixing paint (24).
c. Slipping interior of bowl (32).
d. Painting (32).



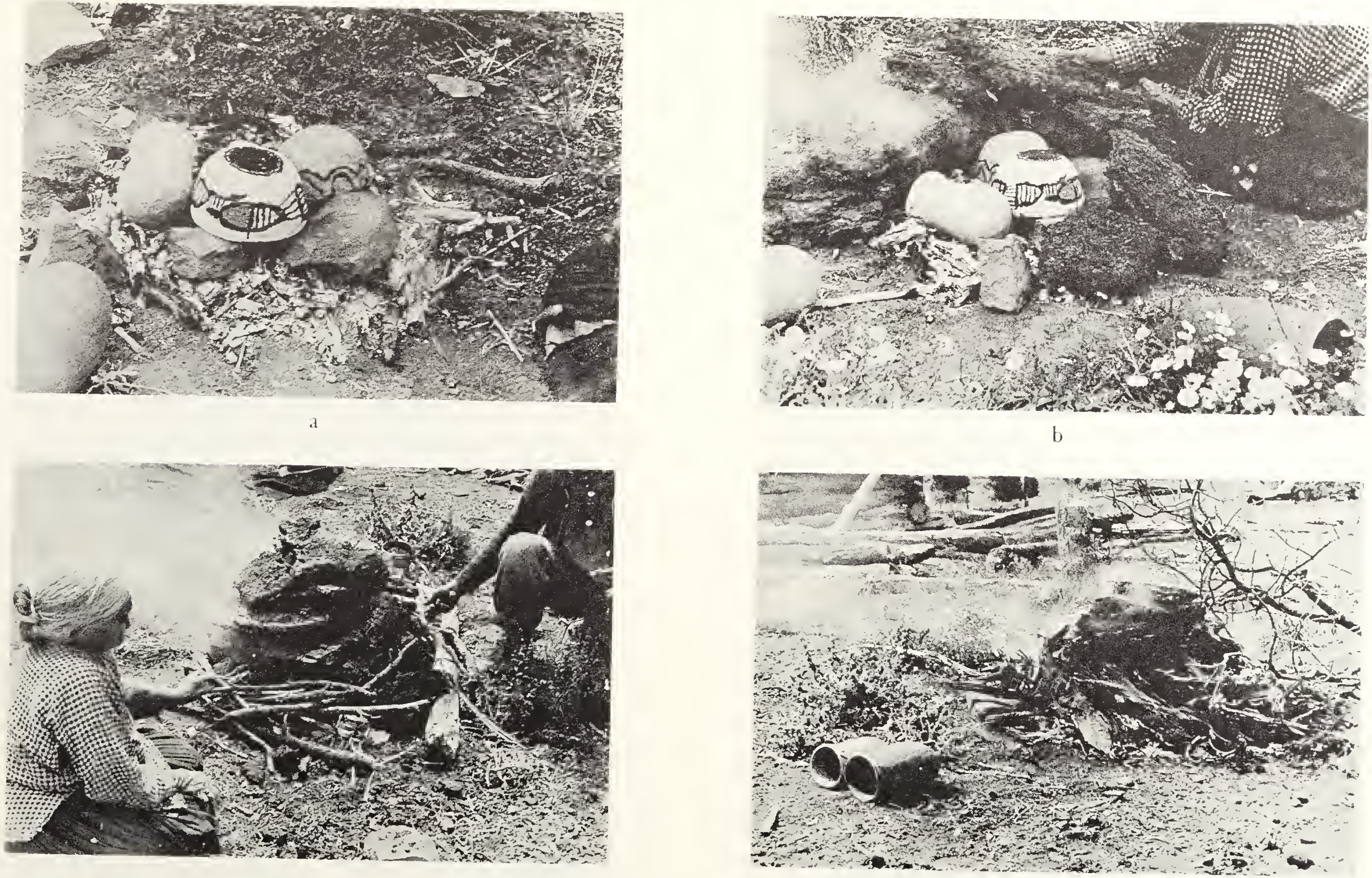
a

b

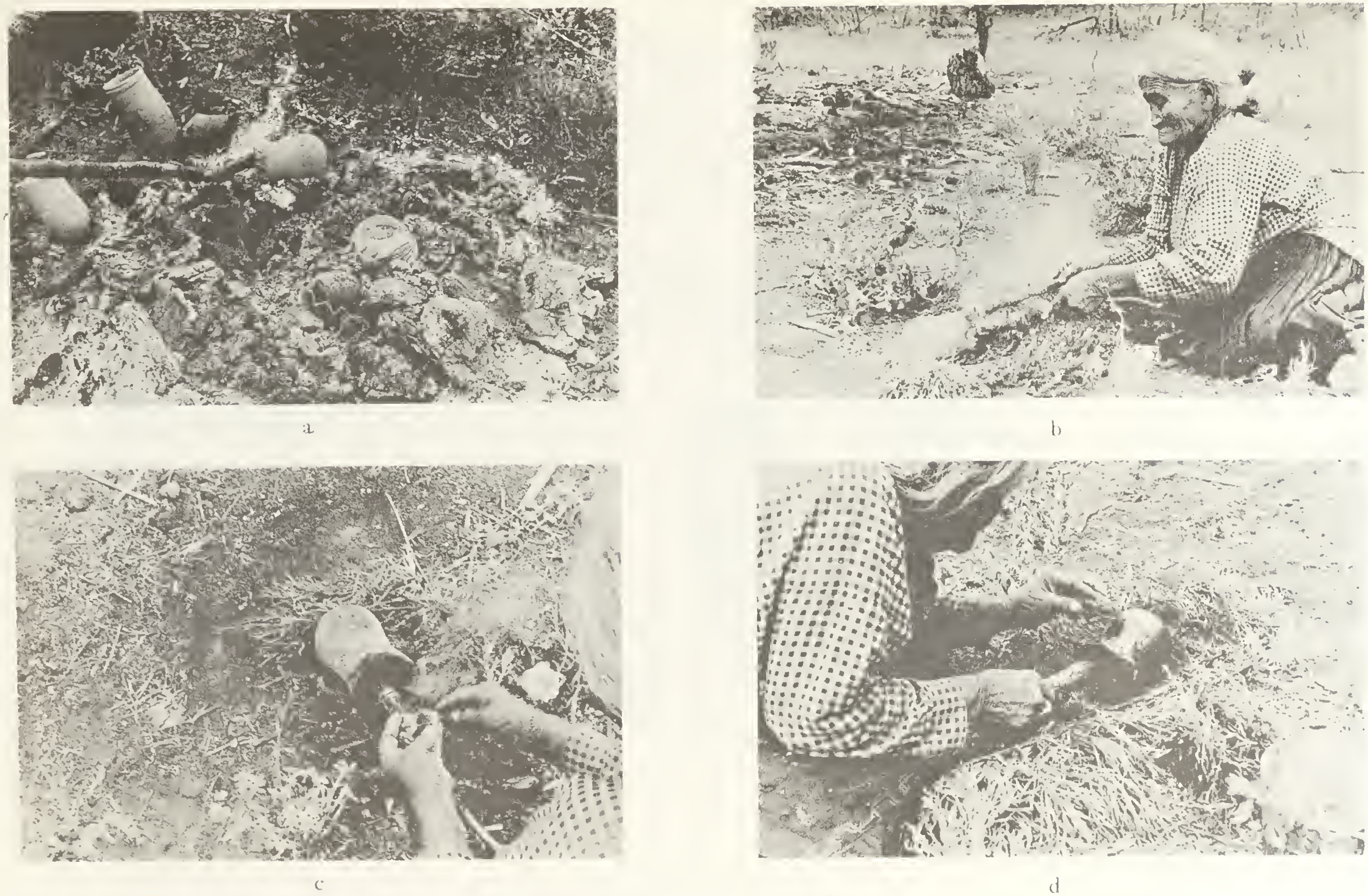
c

d

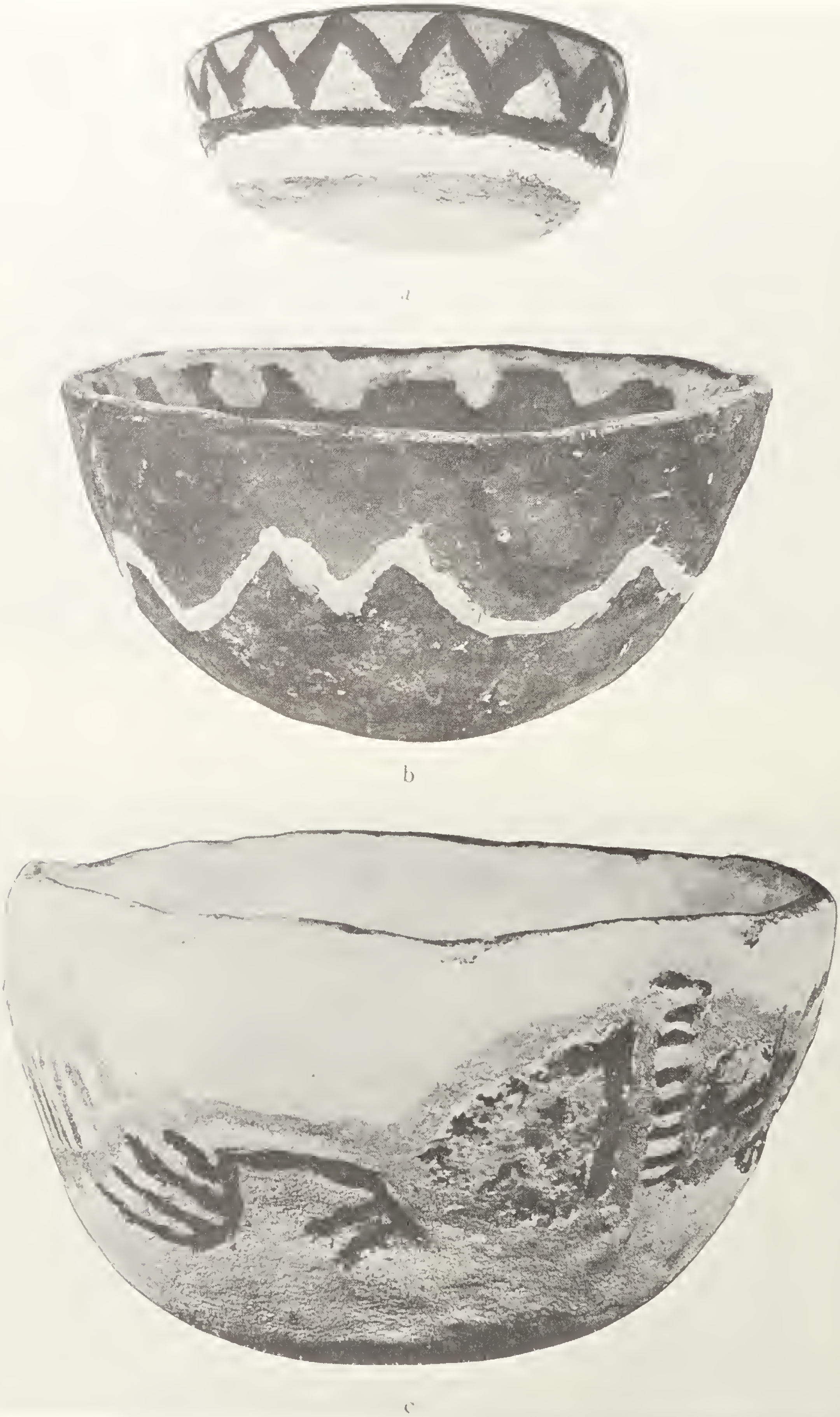
V. PAINTING (32).



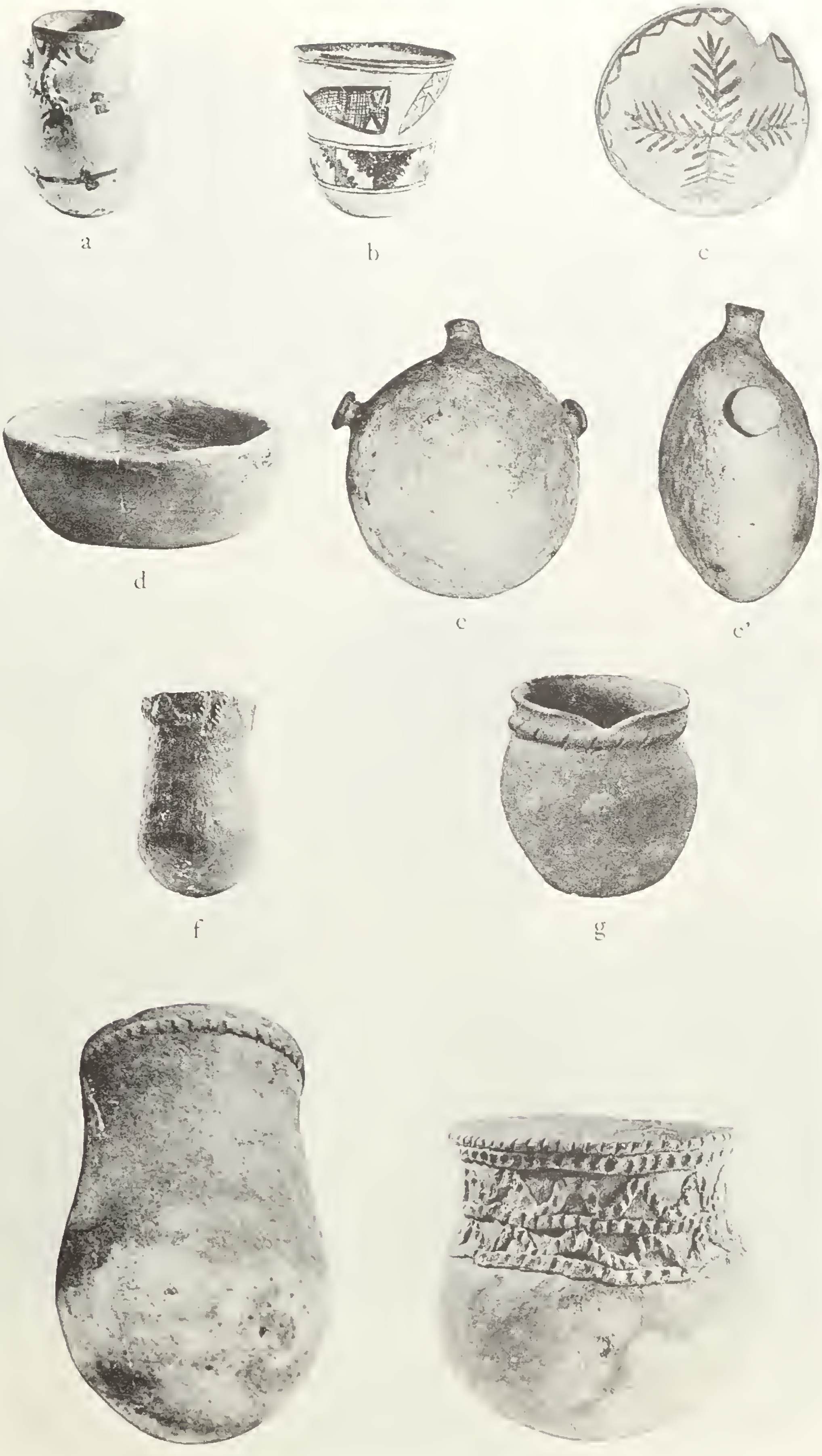
VI. FIRING (32).
a. Vessels placed on stones in ashes of preliminary fire.
b. Building oven over vessels.
c. Completed oven with kindling placed around the sides.
d. Oven half burned down.



VII. Post-firing treatment (32).
a. Removing vessel from ashes of oven.
b. c, d. Applying gum to cooking pot.



VIII. Navaho painted vessels in the Peabody Museum, Harvard University.



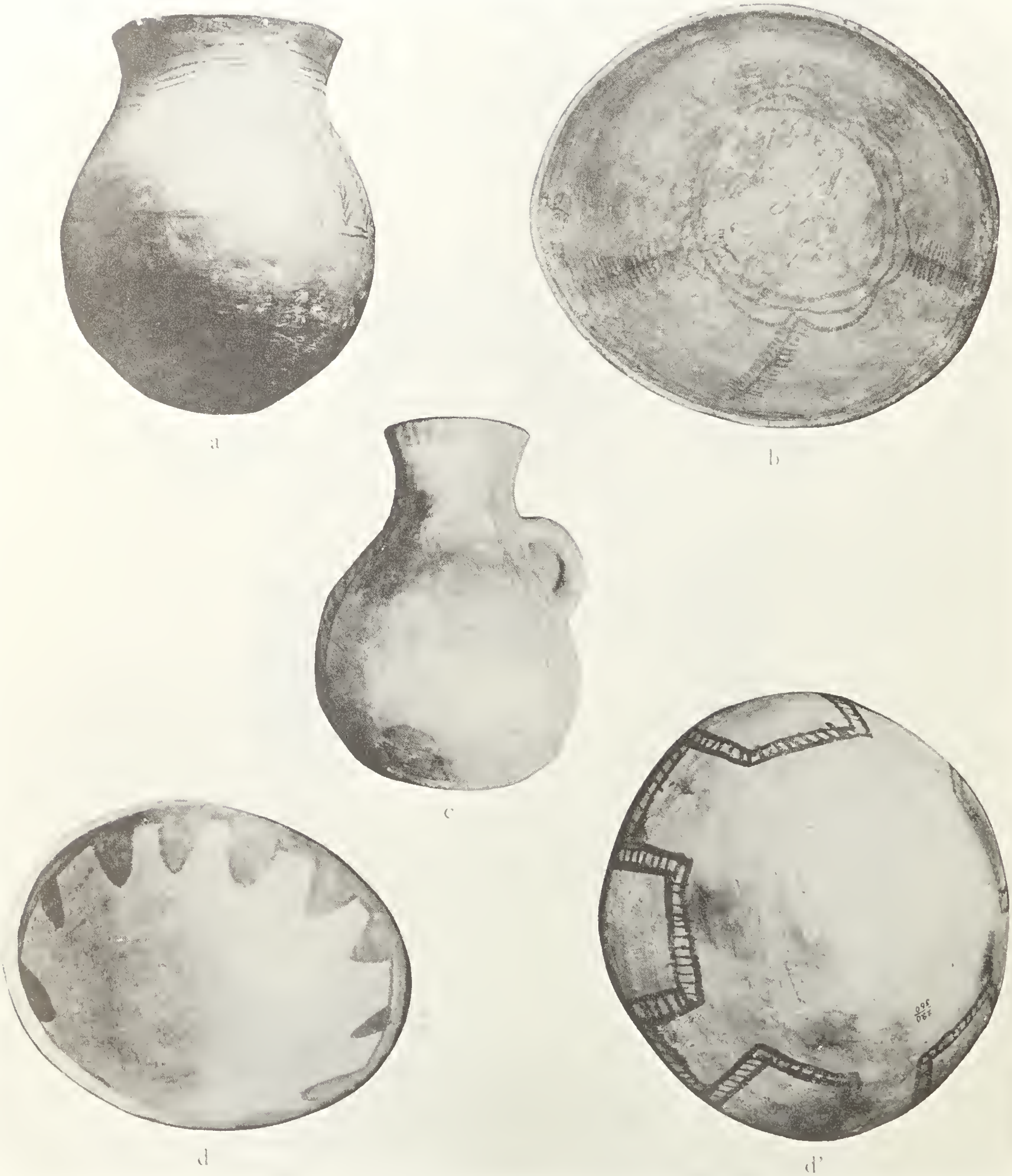
a b c

d e e'

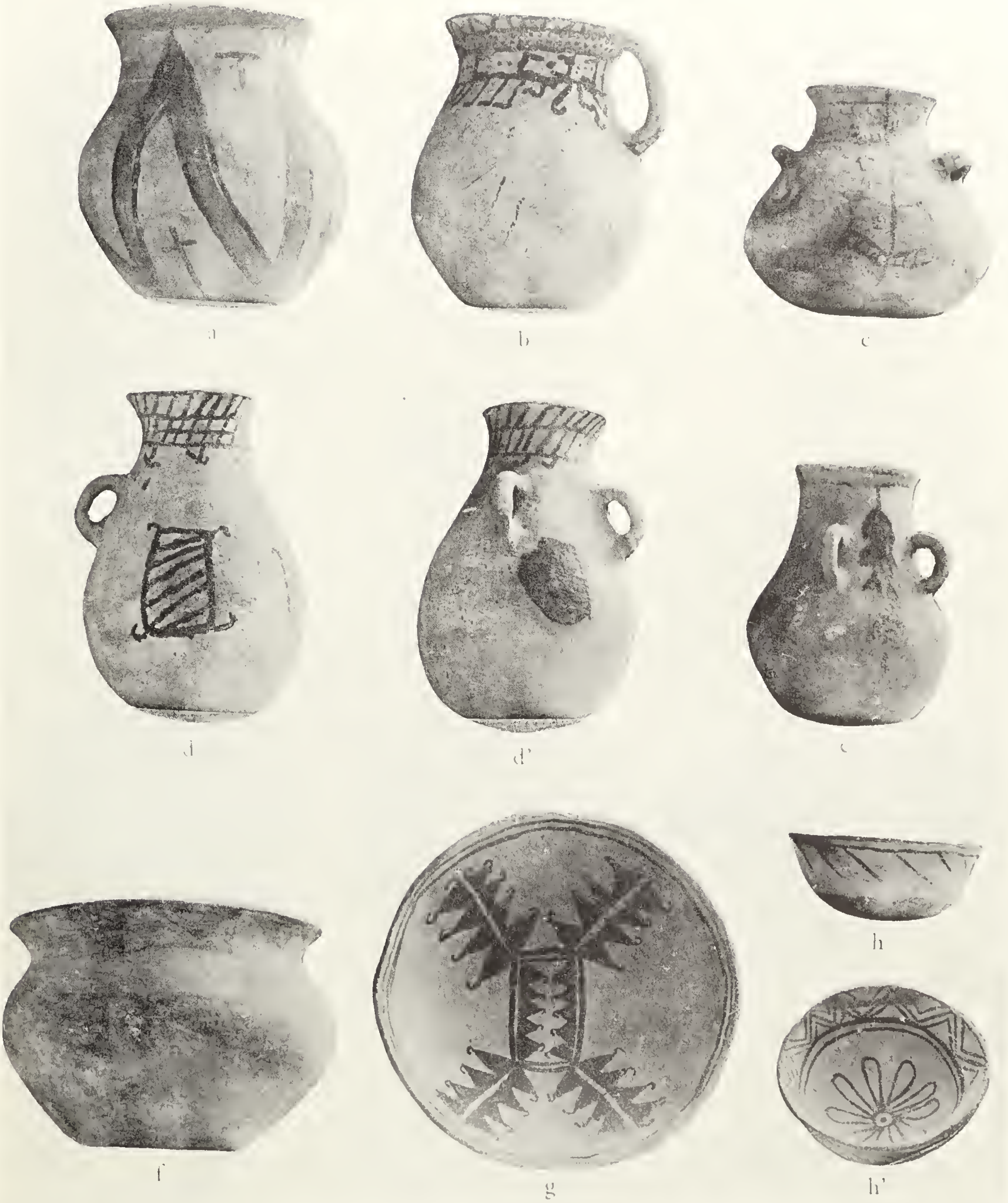
f g

h i

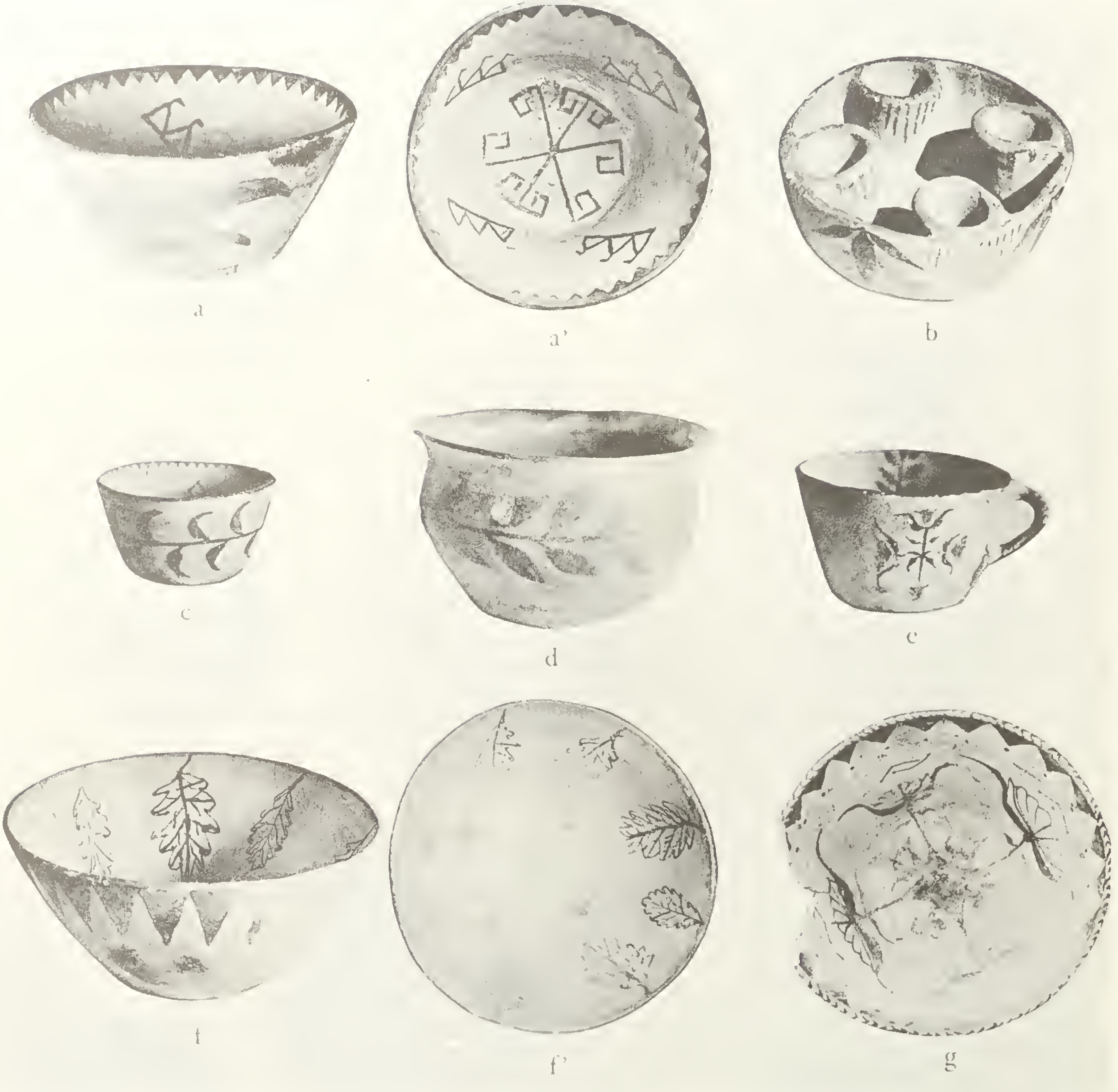
IX. NAVAHO PAINTED AND COOKING VESSELS IN THE PEABODY MUSEUM, HARVARD UNIVERSITY.



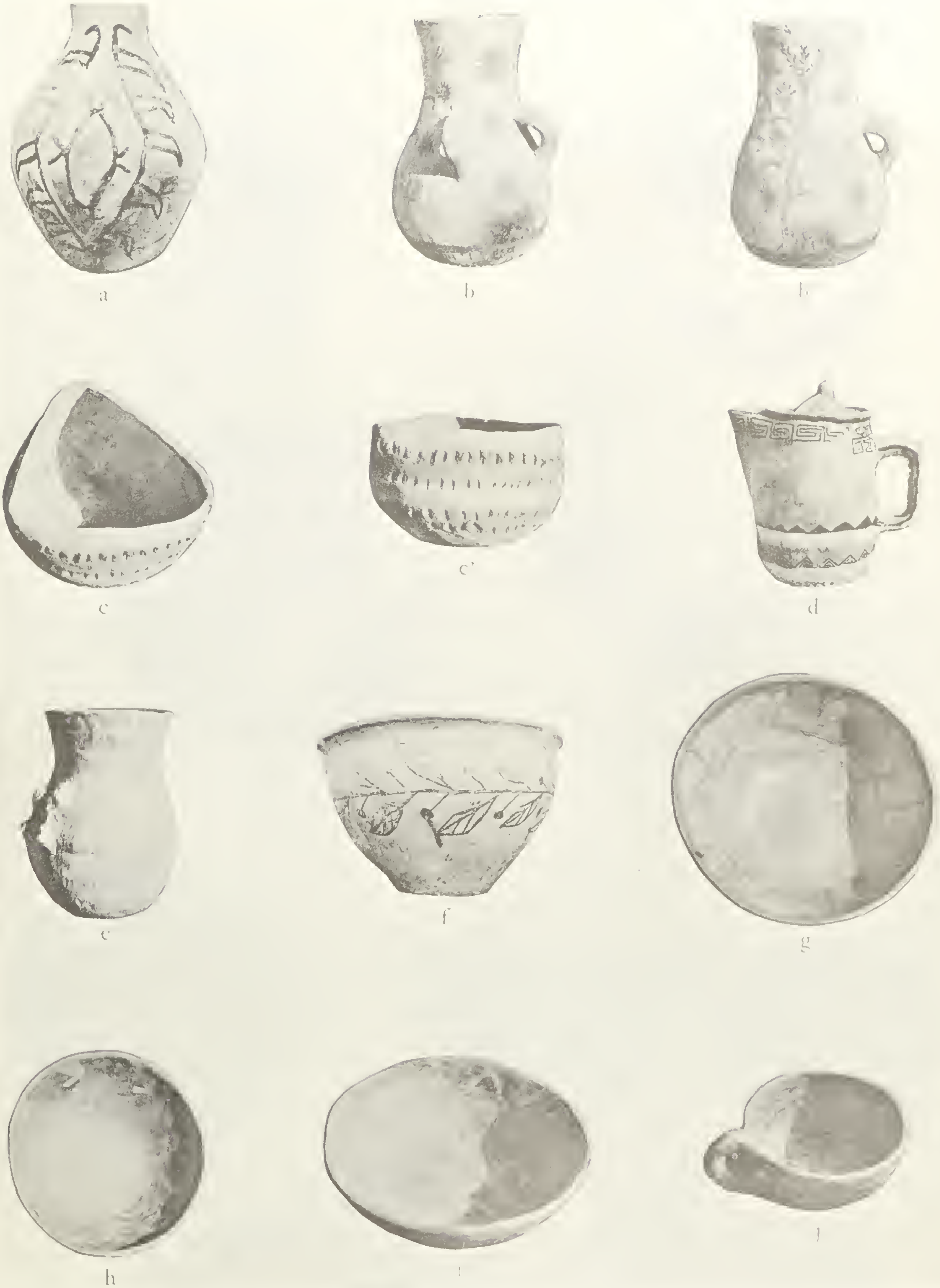
X. Navaho painted vessels in the American Museum of Natural History, New York.



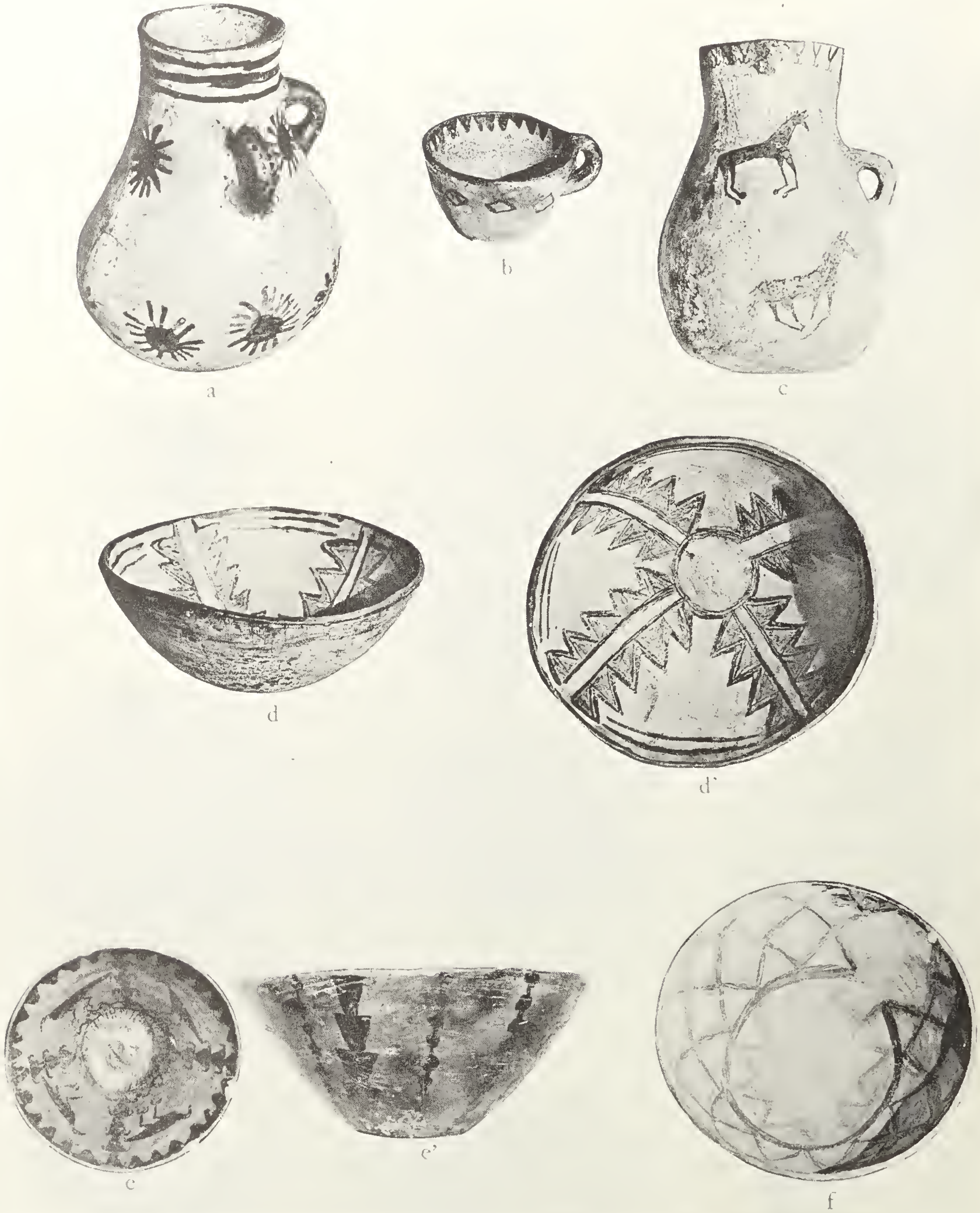
XI. Navaho painted vessels in the Museum of the American Indian, Heye Foundation, New York.



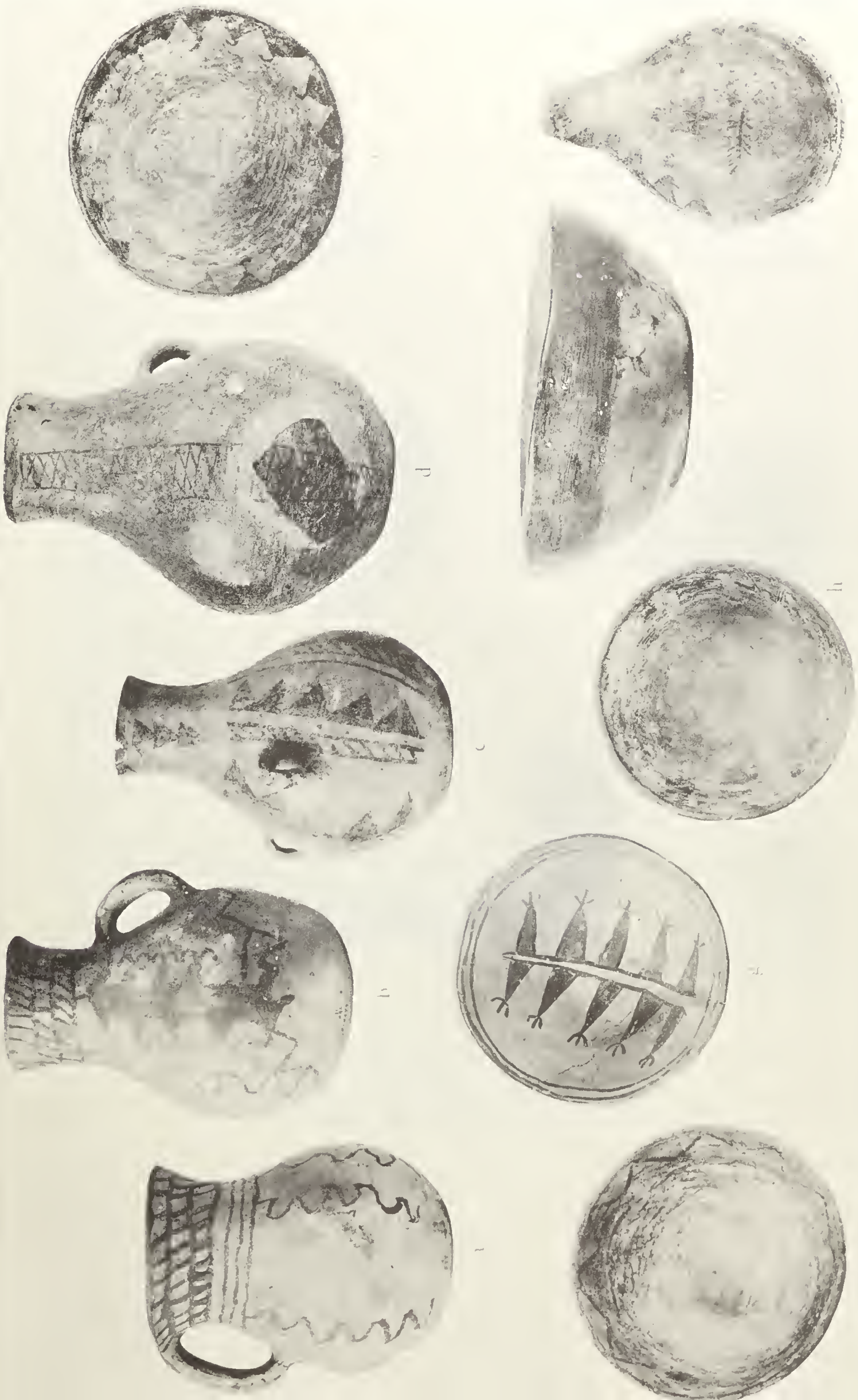
XII. NAVAHO PAINTED VESSELS FROM THE CARRISO MOUNTAINS, ARIZONA, IN THE L. T. MACKINNEY COLLECTION, CHACO CANYON, NEW MEXICO.



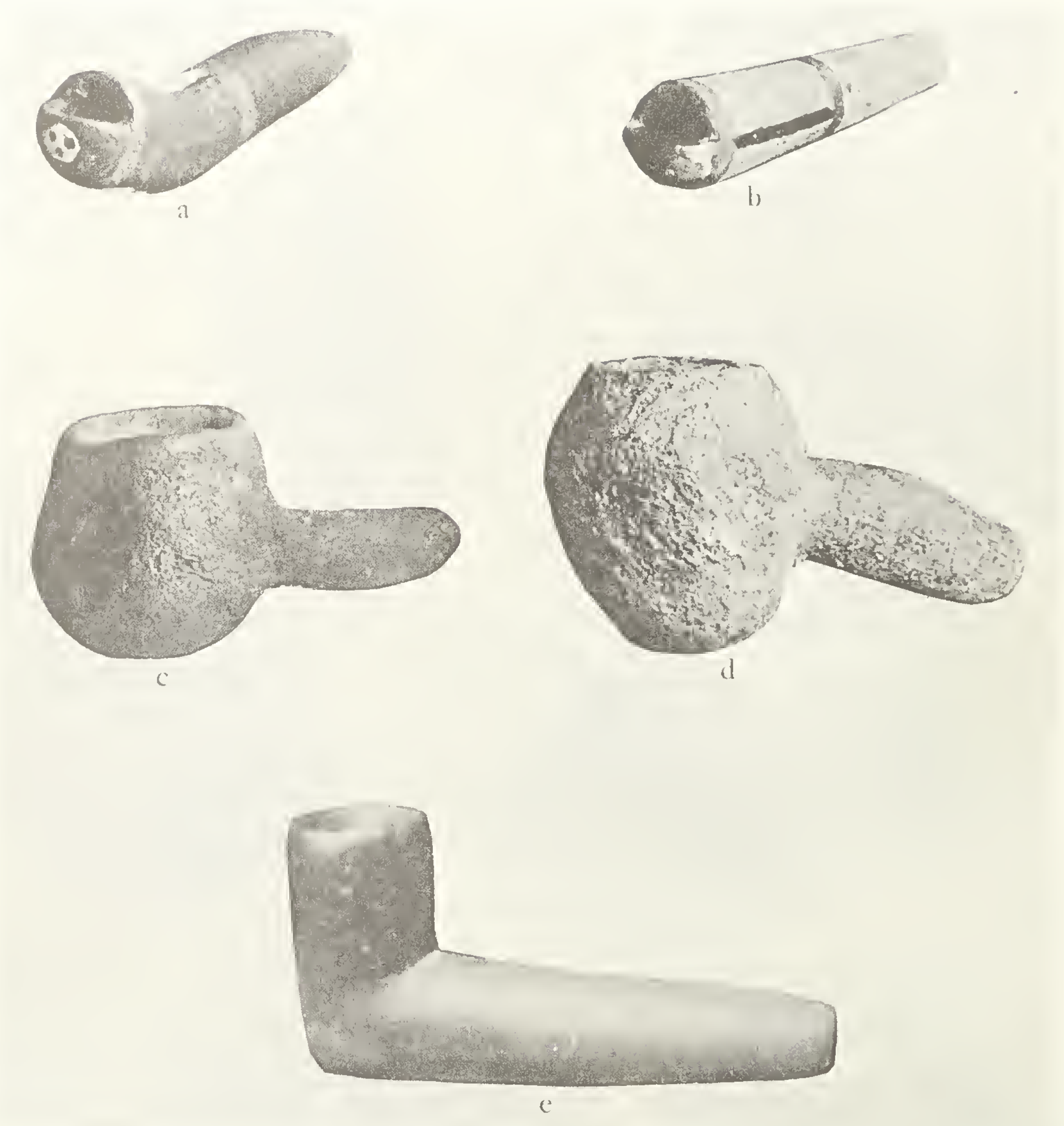
XIII. NAVAHO PAINTED VESSELS IN THE WILLIAM EVANS COLLECTION, SHIPROCK, NEW MEXICO.



XIV. NAVAHO PAINTED VESSELS.
a-d. Denver Art Museum.
e, e'. Taylor Museum.
f. Arizona State Museum.

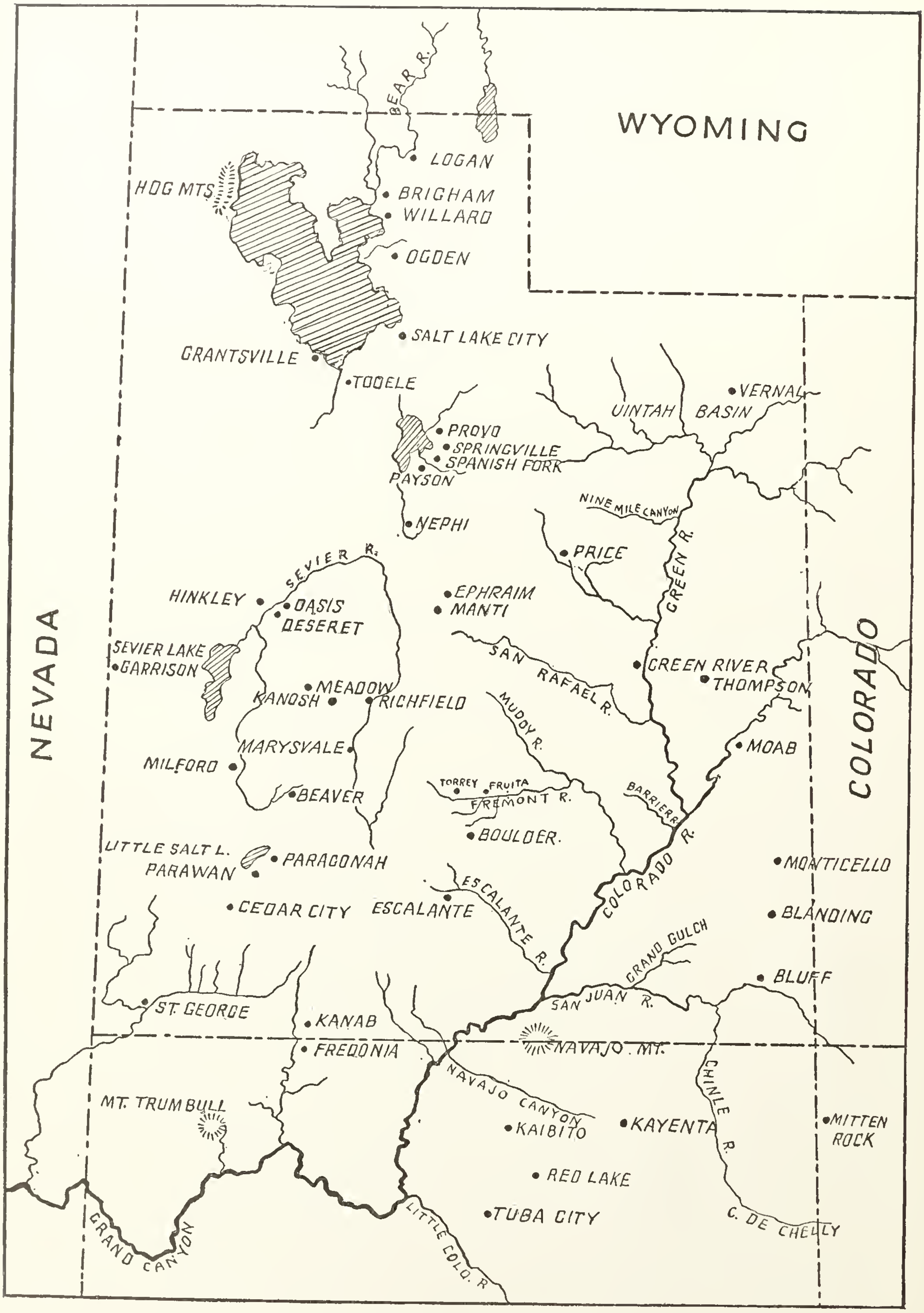


XV. NAVAHO PAINTED VESSELS IN THE MUSEUM OF ANTHROPOLOGY, UNIVERSITY OF CALIFORNIA.



XVI. Navaho pipes.
a. Ritual hunting pipe.
b. Game Way Blessing Way pipe manufactured by 12.
c, d. Talking God Blessing Way pipe manufactured by 1.
e. Archaeological (Pueblo) pipe owned by 12.

ARCHAEOLOGICAL INVESTIGATIONS IN CENTRAL UTAH



Map of Utah Sites

PAPERS
OF THE
PEABODY MUSEUM OF AMERICAN ARCHAEOLOGY
AND ETHNOLOGY, HARVARD UNIVERSITY

VOL. XVII—NO. 2

ARCHAEOLOGICAL INVESTIGATIONS IN CENTRAL UTAH

JOINT EXPEDITION OF THE UNIVERSITY OF UTAH AND THE PEABODY MUSEUM, HARVARD UNIVERSITY

BY

JOHN GILLIN

WITH
AN ANALYSIS OF THE ANIMAL BONES
BY

GLOVER M. ALLEN
PROFESSOR OF ZOOLOGY, HARVARD UNIVERSITY

CAMBRIDGE, MASSACHUSETTS, U.S.A.
PUBLISHED BY THE MUSEUM
1941

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PRINTED BY THE GEORGE BANTA PUBLISHING COMPANY
MENASHA, WISCONSIN, U.S.A.

To

GEORGE THOMAS

President, the University of Utah

FOREWORD

At the present stage in the development of the science of Archaeology, the value of studies of regions peripheral to major cultural centers is generally recognized. In the American Southwest, after a long period of concentration upon the highly developed cultures of Arizona, New Mexico, and southwestern Colorado, an increasing amount of attention is being given to the surrounding areas. Between these areas and the classic centers there may have been an intermittent give and take of traits and influences. An important part of the history of the development of the Pueblo, Hohokam, and other cultures of this area is to be found in this prehistoric exchange of objects and ideas. Western Colorado, Oklahoma, Texas, northern Mexico, California, and Nevada are all being examined now in terms of the Southwest. This report deals with a part of the Northern Periphery included in the present state of Utah.

All recent summaries of progress in the study of the Archaeology of the Southwest deplore the lack of more definite information about the Northern Periphery. The number and variety of ruins north and west of the Colorado River attest the importance of this region. It has long been thought that more intensive study there would produce evidence of value in our task of untangling the multitude of problems the Southwest presents. It has been suspected that the Northern Periphery holds not only examples of diffusion and survival of Basketmaker traits but also that these may represent the source of some of the elements of the classic Southwestern cultures. Realizing the importance of these possibilities, the University of Utah and the Peabody Museum of Harvard University sent a joint expedition to central and western Utah in 1937 to add to our insufficient knowledge of that region, especially of Central Utah, with particular emphasis on furnishing additional plans of sites and illustrations of cultural remains.

Those who have studied this area will remember that our documents are few. We have Montgomery's early and discerning descriptions. These are brief and without plans or illustrations. Kidder discussed the matter with his usual prescience in his *Southwestern Archaeology*, but felt compelled to comment on the inadequacy of his information. Judd, in 1915–1920, gave us our first definite glimpse of the culture of the western half of Utah, but his expeditions were those of reconnaissance. It is remarkable that he was able to accomplish so much in the short time at his disposal, for he really lifted the veil from this section of the state.

Following this there came expeditions of the Peabody Museum along the drainage of the Colorado River in the eastern half of the state, as yet unpublished except for the excellent monograph of Morss on the *Ancient Culture of the Fremont River*, which was the first report with adequate excavation, description, and illustrations. Gillin's monograph on the archaeology of Nine Mile Canyon provides additional information about the northeast. Reagan, whose courageous labors in the face of ill health took him over a great part of the northeast quarter of the state, has written extensively but not illuminatingly. To the Southwest, Harrington's work at Pueblo Grande, not yet published in detail, and Hayden's monograph on Mesa House, throw light on the character of Utah culture, while Harrington's reconnaissance of sites on the Nevada-Utah border has given us tantalizing notes. In the Zion Canyon region the work of Wetherill and others has appeared in interesting though very brief reports. Nusbaum's excavation of Cottonwood Cave is of course a classic.

Our chief reliance, however, must be upon the thoughtful work and discussions of Julian H. Steward, who, on the basis of excavations and reconnaissance in many parts of the state, for the first time organized the material so far available and ably laid the ground for further studies. Yet Steward would be the first to admit the great need for further excavation and description.

With this in mind, the chief aim of the joint expedition of the University of Utah and the Peabody Museum was to build up the documents available for the study of the pre-history of the Northern Periphery. The central portion of the state was chosen for two reasons in particular. First, less work had been done in that area; and, second, the excavations here might show whether the major movement of cultures in the state had been from east to west or the reverse.

It would be premature to attempt a definitive exposition of the position of the Northern Periphery in the cultural history of the Southwest, but it presents problems of more fundamental importance than is commonly realized. For a portion of the picture, the hypothesis of Morss, with some important modifications seems tenable. This hypothesis holds that the Basketmakers, or a modified Basketmaker culture in Utah continued on with a more slowly developing culture and without at any time passing over wholly into the Pueblo stage of the South. From time to time they received intrusions of the Pueblo culture which are reflected in a cruder form in their artifacts. But if this is so, why should the South have advanced so much more rapidly and the North have lagged? This raises basic questions in the study of the growth of cultures for it is by now apparent that the Basketmaker-Pueblo cultures formed a continuum and that no *deus ex machina* of an intrusive culture or race can be assumed, off hand, to furnish an easy solution. In any case the Northern Periphery is certain to amplify our knowledge of the Basketmakers and possibly to throw great light on their early movements and diffusion.

It may well be that it is to the Northern Periphery that we must look first of all for the early history of the Hopi. It is well known that the Hopi language is closely related to languages spoken by Ute, Paiute and other tribes to the North. What is perhaps less well known is that the Hopi tongue is more like the languages of the Mono-Bannock group living toward the extreme north of the Northern Periphery than to those of tribes now living further south and nearer geographical neighbors of the Hopi today. These facts of course are suggestive only but they do indicate that here we may have a real problem. What were the steps by which one group out of a number of people speaking related languages took over Pueblo culture? Or, conversely, such a study might reveal a complete acquisition of a language of northerly affiliations by a branch of the original people in Arizona.

It often happens that in studying any problem its marginal aspects throw into greater and more easily studied relief, data which are less evident or obscured in the more central areas. In a way, it supplies us with a somewhat controlled condition, the absence of which is often lamented in the study of social behavior or of the development of culture. For this reason alone the Northern Periphery deserves much more attention than it has been accorded. A periphery is, by definition, further removed from the vital center.What traits of culture carry over to it? Which are lost, and why? How are these traits affected by an environment characterized by new norms of climate and terrain?

The present report is a straightforward record of the careful excavation of a number of sites and subsequent detailed study of the material and information obtained. It does not pretend to solve the problems of the Northern Periphery but rather to provide further important evidence to be added to the relatively scant records already available.

Donald Scott
Director
Peabody Museum

PREFACE AND ACKNOWLEDGMENTS

THE excavations carried on in the summer of 1937 were financed jointly by the University of Utah and the Peabody Museum of Harvard University. To Dr. George Thomas, President of the University of Utah, I am indebted for constant good will and practical encouragement. The able assistance of John M. Longyear, III, and of Mrs. Marshall Newman requires special tribute. Mr. Longyear served as representative of the Peabody Museum in the field and, among other accomplishments, he measured and made scale drawings of all sites and structures. Furthermore, he undertook the difficult task of rephotographing part of the collection at the Peabody Museum and of arranging the plates which appear in the present report. Mrs. Newman performed a thorough overhauling of the author's literary style in the interests of clarity, edited and prepared the manuscript for the printer. While the author alone is responsible for faults, much of whatever merit the present work may have is to be credited to the labors of Mr. Longyear and Mrs. Newman. Finally I wish to express my gratitude to the Peabody Museum of Harvard University for undertaking to publish the present paper. My most sincere thanks are also due to Mr. Noel Morss for comments made after reading the manuscript.

The accomplishment of activities in the field was in large measure due to the skill and energy of the members of the field staff serving on a partially voluntary basis. The other members of the field staff were Robert Lister, University of New Mexico, William Mulloy, crew foreman, University of Utah, Arden King, Shirl Winder, James Miller, McKeen Brimhall, Lawrence Angleman and Carling Malouf, all students at the time in the University of Utah. Raymond Proctor of Salt Lake City served as cook. Although some hired help was employed, the fact that every member of the field staff was willing and able to work in the actual excavations resulted in considerably more work being accomplished than would otherwise have been possible with the funds at our disposal.

Mr. Elmer Smith aided us with preliminary explorations, gave freely of his knowledge of the region of Ephraim, and has kindly contributed notes and rechecks on one or two doubtful points. I have drawn on his researches in this general region and wish to express my thanks for his cooperation. I also wish to express my appreciation to Mr. Smith and Mr. Carling Malouf for the valuable cooperation and information obtained from their inspection and further excavation of Ephraim 1, Houses IIa and IIb.

We are indebted to the following residents of central Utah for their assistance and for permission to examine or excavate on their properties: Messrs. George and John Henry of Marysvale (Marysvale 1 and 3); Mr. Roy Barlow of Junction (Marysvale 7); Mr. Ralph Ross of Sevier (Clear Creek Canyon Cave); Mr. James Nielson of Ephraim (Ephraim 1); the International Smelting and Refining Company through Messrs. James Elton and Brigham Young (Tooele 1); Mr. George E. Jewel (Skinner's Canyon Petroglyphs).

The Ohio State Museum at Columbus has kindly provided space for laboratory study and photography of the collection and I wish to thank Mr. Harry C. Shetrone, Director, and Mr. Richard Morgan for their kindness in this regard.

My wife, Helen N. Gillin, assumed a large part of the task of sorting and repacking the collection and assisting in the preparation of the manuscript.

This paper was prepared for publication in February, 1938, and revised in February, 1939.

John Gillin

Columbus, Ohio
February, 1939

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ARCHAEOLOGICAL INVESTIGATIONS IN CENTRAL UTAH

THE SITES AND THEIR STRUCTURES[1]

SITES NEAR MARYSVALE

THE floor and sides of the valley of the Sevier River in the vicinity of the present town of Marysvale, Piute County, were once, according to old residents, the location of fairly numerous remains of prehistoric habitations. In the summer of 1937 one valley bottom site (Marysvale 3) and one elevated site (Marysvale 7) comprised the only remains sufficiently intact to yield scientific results of significance, due to the destruction of other mounds and ruins by farming and grazing operations.

MARYSVALE 3

Marysvale 3 was a large mound, about 88 feet north-south by 72 feet east-west, which rose before excavation to a height of about 3 feet above the surrounding surface. The site is located in the valley south of Marysvale on the farm of George Henry, township 28 S, range 3 W, and in a field about three-eighths of a mile southeast of the Henry ranch house. The slope upward to the mountains begins about one-half a mile to the west of the mound, while to the east the rolling, relatively smooth bottom land of the Sevier valley slopes gently for about five miles to the low cliffs at the side of the river. Water for the ancient inhabitants was probably supplied from a stream, which is now diverted for irrigation, but which once flowed from the mountains to the west and passed close to the south of the site. According to the present owners of the land, the mound was opened in the nineties of the last century by Professor Henry Montgomery, but the writer is unaware that he published any details of his finds, other than the following:[2]

> An account of my investigations in the pre-historic town near Marysvale in Piute County, and elsewhere in the valleys of Utah, would be almost a repetition of that just given of the investigations in Juab and Iron. . . .[3] But, everywhere the same permanent buildings, the same walls, roofs and floors are observed, the same wonderful pottery, and the same stone and bone implements, utensils and ornaments are presented to the eye of the explorer.

Later, local amateurs had enlarged Montgomery's original excavation in desultory fashion, and Mrs. George Henry, wife of the present occupant of the land, reports that some years ago she took a skeleton, now lost, out of the mound. This mound is apparently the last survivor of a number of similar ones which dotted this part of the valley before they were levelled by modern agriculture.

It was decided to open the mound again in order to discover the stratigraphy, if any, and to provide an accurate description of whatever structural remains were discovered in a stratigraphic test. The previous excavations had been confined to a hole, about 6 feet in diameter and 2½ feet deep, in the center of the mound and a few shallow "pot holes" about the surface.

A base line was laid on a north-south bearing across the middle of the mound. Six foot squares were laid off this base line on either side beginning at the south end. Collections and all indications were noted by squares and by 1 foot levels until the general situation of the mound stratigraphy and structures became apparent. A trench, 18 inches wide, was cut through the entire mound alongside the base line, skirting the east edge of the previously excavated hole. A second trench to the east was cut through in line with the south side of square 7 E. A third trench was laid off to the west from the southwest corner of square 8 W. In this manner, stratigraphic sections on both the cardinal diameters were obtained. The extent of excavations is shown in fig. 1.

Fig. 1 shows in cross section the stratigraphy in the central part of the mound. Five well-defined floors occur, made of hard-packed adobe. Floor 1 was 11 inches below the surface and rested directly on top of the ruined walls of House 1. Floor 2 was 28 inches below the surface of the mound and was practically horizontal. This floor was found inside House 1 and outside to the north. Four inches below floor 2 and 32 inches below the surface of the mound was floor 2a, the "original" floor of House I; this floor was traceable only inside the area enclosed by the walls of this House. It appears that floor 2 (which lacked a fireplace in the House) represented a second occupation level connected with the use of the House.

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[1] In the following description of the sites and their structures all measurements which appear on the scale drawings (figs. 1 to 15) are omitted from the text except where clarity demands their inclusion.

[2] Montgomery, 1894, p. 306.

[3] This refers to rectangular, free standing, adobe-walled structures previously described in his report.

Eight inches below floor 2a and 40 inches below the surface, floor 3 was found. Floors 1, 2 and 2a were in the stratum of organic earth, ash, charcoal and culture-bearing material which formed the bulk of the mound. Floor 3, on the other hand, was located at the bottom of this material and lay directly on top of the underlying stratum of sand and gravel which formed the subsoil base under the mound itself. The sand and gravel under floor 3 was apparently flood deposition from the mountain slopes and floor 4 was discovered within this gravel and sand stratum, 12 inches below the level of floor 3, and 4 feet 4 inches below the surface of the mound.

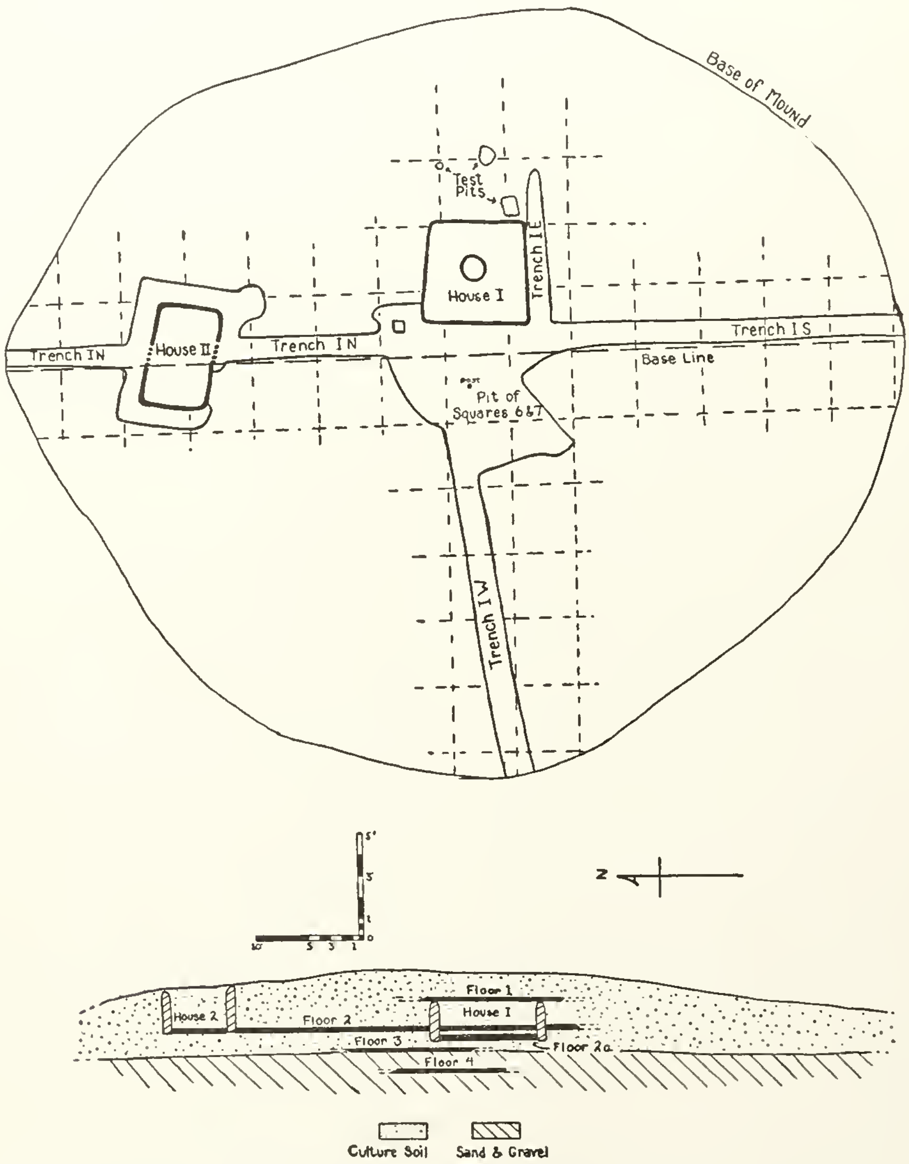

Fig. 1. Marysvale 3. Plan of excavation and cross section.

Starting at the bottom we may now mention certain details concerning these several levels. In floor 4 (the lowest level) a charred upright post butt, 2½ inches in diameter, was found imbedded and extended 5 inches below the floor level. The floor around it for a radius of about 8 feet was cleared, but no evidence of other posts or of a firepit was found, although some charcoal and several pieces of large charred beams were found to the west of this post, lying within the layer of flood sand and gravel shown in fig. 1. The post itself was charred above floor level and uncharred below. An extension of the pit was made to the southwest (Square 7 in fig. 1) so that an extension of the level was obtained for nearly 11 feet in this direction from the post. The most plausible explanation of this situation seems to be that floor 4 represented an occupation level, possibly the site of a pit house which had been overlaid with sandy gravel in a flood, which obliterated the features of the structures in the process. No artifacts were found at this level. A complete excavation of the mound might have clarified the situation, but it is a rare post-supported house in Utah which reveals no posts or other features on the floor within a radius of 8 feet of one of the uprights. It was therefore decided that the characteristic features of the floor 4 structures had been swept away and that further excavation was useless. On the basis of the one upright post, a pit house, perhaps of the Grantsville type,[4] is postulated for this level, since this is the most common type for this general area in which upright supports of this size are used.

No structural remains were found in place at the floor 3 level, although this floor was overlaid with charcoal in lens formation.

Floor 2 could be traced in the north-south trench through most of the trench's length. Toward the north end of the mound was House II with its floor apparently conforming to the floor 2 level, showing that House II was erected after House I was first constructed. House II (fig. 1) was rectangular with adobe walls. No fireplace was present in the floor, which was of tamped adobe. Charred beams and roof adobe were included in the fill, which leads one to suppose that a flat roof with roof hole entrance characterized this structure. No roof hole cover was found in the house, although an irregular slab of sandstone was found in the trench about 8 feet to the south, which may have served to cover the roof entrance. A pit through the floor of House II, located in reference to the walls 34 inches north and 4 feet 3 inches west, showed an adobe floor, 3 inches thick and a cultural stratum, 15 inches thick, resting on a possible floor (floor 3?) which was underlaid by sterile sand and clay.

House I (fig. 1) contained two floors (floors 2 and 2a). Floor 2a, the original floor of the house (conformable to the lower limits of the walls), was 4 inches below floor 2, which apparently represented a later occupation level both within the house and outside. The interior fireplace and extreme irregularity of the exterior surfaces of the walls of House I suggest a modified pit house. We have tentatively concluded, however, that House I had free-standing walls whose outer surfaces had been much weathered and pitted and whose thickness varied at the time of excavation from 4 inches to 11 inches. The fireplace, which was situated in the center of the floor, measured on the outside of the rim 32 inches in the north-south diameter and the east-west diameter, thus being almost perfectly circular. The rim was a circle of adobe which stood 1 inch above the floor level and 3 inches above the adobe-surfaced bottom of the pit. The average width of the rim was $4\frac{1}{2}$ inches. A quantity of roof adobe and charred beam fragments occurred in the fill as well as artifacts and pottery. No door was found in the walls.

Several pits were sunk to the east of House I which showed that this part of the mound apparently represented a dump with no floor levels. A trench running east and west along the outside of the south wall revealed evidences of the continuance of floor 2 outside the walls to the south, although the stratigraphy of the main north-south trench showed that this faded out about 7 feet to the south. A pit through the firepit of House I revealed the following sequence from top to bottom:

1. 5 inches of ash.
2. $\frac{1}{2}$ inch layer of sterile dirt.
3. 4 inches of culture-bearing stratum.
4. 1 inch of hard adobe floor (floor 3).
5. 11 inches of sand and gravel below which, at a depth of about 17 inches from the top of floor 2a, was encountered the upper surface, presumably of floor 4.

The thin layer of sterile dirt under the floor of House I (floor 2a) indicated that the site had been abandoned or uninhabited for a short time before the construction of the house. Floor 3 was thus $9\frac{1}{2}$ inches below the surface of floor 2a in the firepit. Another test pit, 18 inches east of the one just described, showed floor 3a 8 inches below the surface of floor 2a while in the stratigraphy of the central part of the mound to the west of House I, floor 3 was also 8 inches below floor 2a. In short, both floors varied slightly in level, as might be expected. In view of the fact that we did not uncover all of floor 3, however, the section in fig. 1 does not take these minor variations in level into account and shows a simplified rep-

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[4] Steward, 1933a, pp. 9–15.

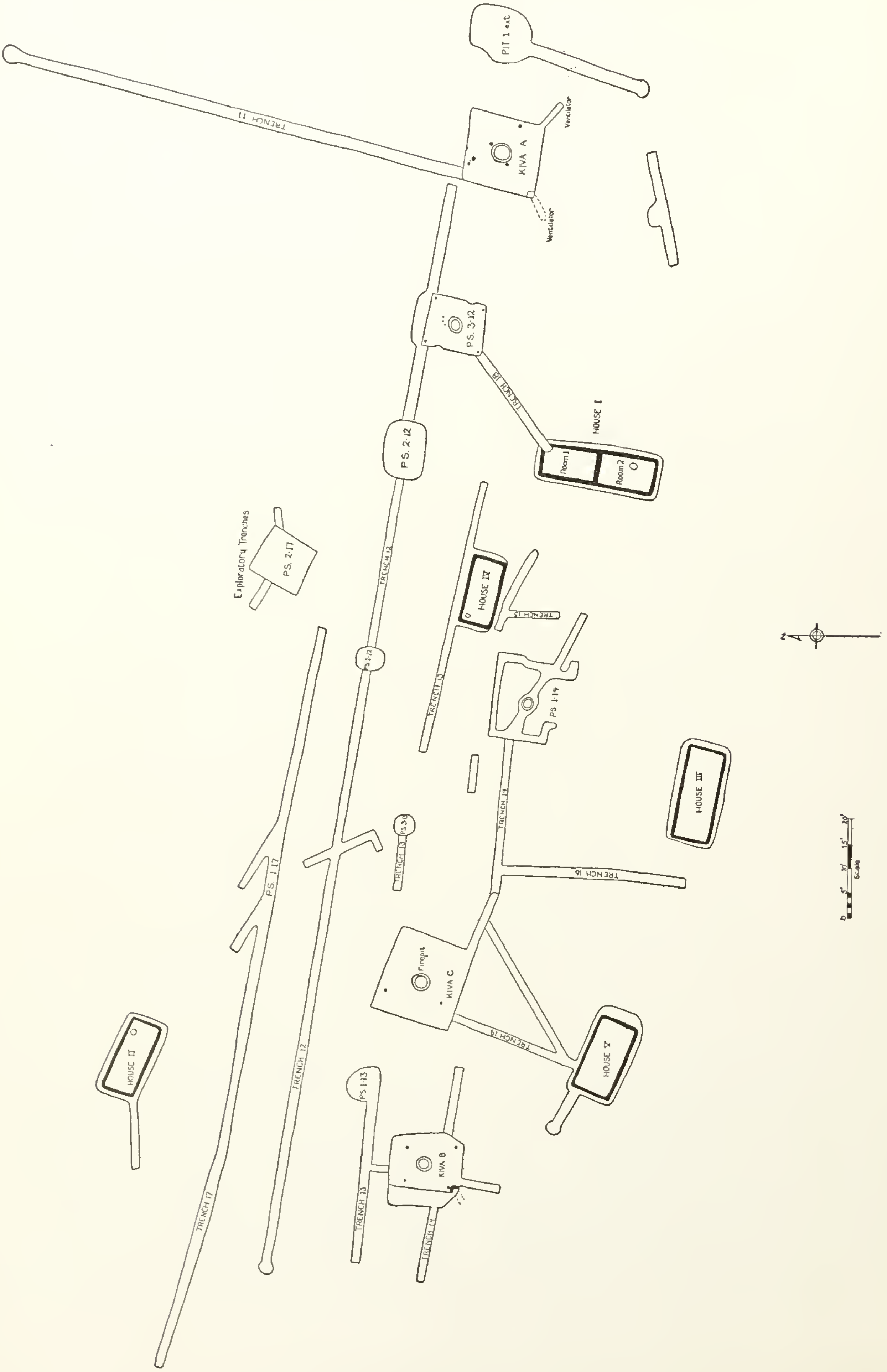

FIG. 2. MARYSVALE 7. PLAN OF EXCAVATION.

resentation of the situation as represented in the stratigraphy of the fireplace test pit.

Floors 2 and 3 could be traced in the trench (1 W) to the west. Floor 2 extended, so far as the stratigraphy of the trench showed, to a point 16 feet west of the west wall of House I and floor 3 extended about 20 feet. Charcoal and the pieces of a restorable pot were found on floor 2 in Trench 1 W 13 feet west.

To summarize, it appears that this site was first occupied by people living in semi-subterranean pit houses, although this is more a conjecture than a certainty (floor 4). After the abandonment of these structures, flood action destroyed and overlaid this first level of occupation with gravelly deposits. The site was reoccupied after the flood deposition had taken place (floor 3), although no structural evidences of this second occupation were found. Occupation was probably more or less continuous, with possibly very temporary lapses such as that preceding the building of House I, until the final abandonment of the site. Floor 2a is the next definite level of occupation and is associated with the quadrilateral, free-standing adobe-walled house with interior fireplace (House I). A second floor, lacking a fireplace (floor 2) occurred within the walls of this house, showing that it was reoccupied or repaired, possibly after a short desertion. Floor 2 extends outside the house and is associated with House II, which also lacks an interior fireplace. This evidence makes it appear that the first adobe-walled houses at Marysvale 3 had interior fireplaces, but that later the custom of locating the fireplace outside the house was introduced. Both the houses were apparently entered through the roof. The highest well-defined floor is floor 1, which was apparently established after the ruin of both houses.

The definite characterization of the cultures of these several occupation levels is unsatisfactory because of the disturbed condition of the mound.

MARYSVALE 7

The site designated at Marysvale 7 is located about two and a half miles west of Marysvale just outside the mouth of Bullion Canyon. The prehistoric remains were found atop a steep-sided ridge of gravel and mud float which extends eastward from the mouth of the canyon parallel to and north of Bullion Creek. The highest point of the site is 452 feet above the bed of the creek, which probably served to supply water to the ancient inhabitants. No vegetation other than sagebrush and scattered tufts of grass existed on the ridge when we first examined it. Exposed to the elements, all traces of human occupation, other than sherds, had disappeared from the surface. A mere surface examination seemed to indicate that not more than two or three structures were present. The top of this ridge averages about 125 yards in width (north-south) and the surface slopes toward a shallow central (west-east) depression. The prehistoric structures were located along the south edge of the ridge and were strung out south of the central depression for a distance of 300 feet (east-west) beginning at a point about 300 yards from the east end of the ridge. The prehistoric settlement extended roughly 135 feet north and south.

The archaeological procedure here consisted of: first, collecting cultural material from the surface; second, sinking test pits in spots indicated by surface features as possible house sites; third, running trenches off the test pits until further sub-surface structural material was located. In this way Houses I and II were discovered. Later a systematic series of parallel trenches with perpendicular branches was opened along the entire east-west length of the site in order to locate all possible structures. Reference to fig. 2 will acquaint the reader with the plan of excavations as they existed when the work was completed; certain of the earlier trenches had been filled by that time.

Four types of structures were uncovered at this site; pit structures, semi-subterranean houses, kivas and houses. They will be described in what might be called typological order.

Pit Structures. These will be found in fig. 2 labelled, respectively, as P. S. 1–17, P. S. 1–12, P. S. 2–12, P. S. 1–13 and P. S. 3–13. All of these were completely excavated with the exception of P. S. 1–17.

TABLE 1. COMPARATIVE PIT STRUCTURE MEASUREMENTS

Pit structures	Average depth of floor from present surface	Average thickness of over-burden	Average depth of pit into subsoil
1–12	21 inches	10⅓ inches	10⅓ inches
2–12	21 inches	9¾ inches	11¼ inches
1–13	11 inches	13 inches	18 inches
3–13	36 inches	15 inches	21 inches

Pit structure 1–13 was irregular with a level and comparatively smooth floor. The walls, which merged into the floor in an arc of a circle about 5 inches in radius, made an angle of about 15 degrees outward from the vertical. To a distance of about 10 inches above the floor isolated lumps of adobe, bearing wood impressions, together with small pieces of charcoal, were found. Four and a half inches above the floor near the center of the pit was a lens of ash and charcoal, averaging 9 inches in diameter and 3 inches in maximum depth.

Pit structure 3–13 was roughly rectangular, with a comparatively level floor which had been smoothed, although not plastered. In this pit, in addition to bones and artifacts, were found several pieces of burned adobe bearing wood impressions.

In summary, we may say that this type of structure is irregular in outline and of comparatively small size.

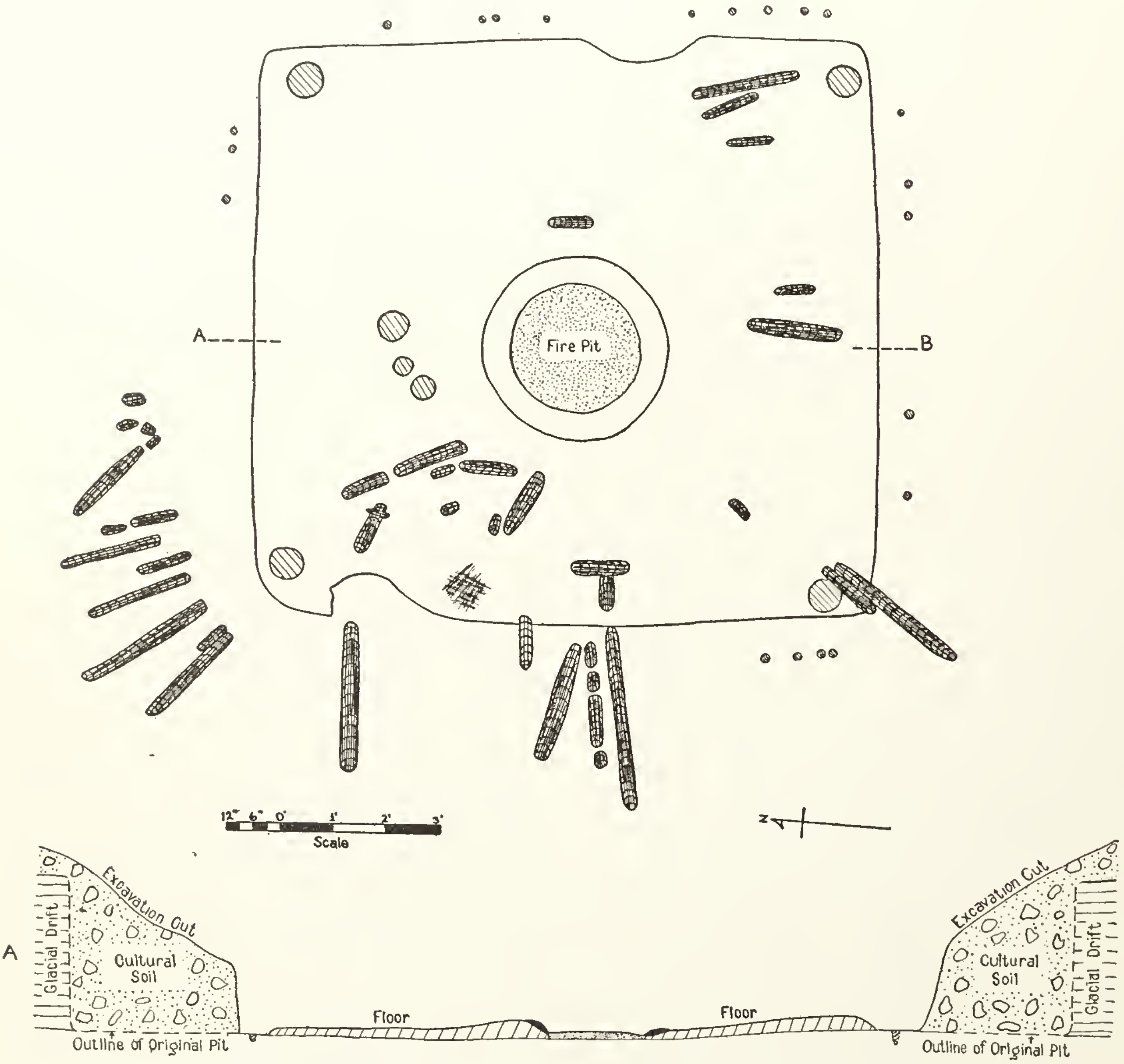

Fig. 3. Marysvale 7. Pit structure 3–12. Beam pattern and cross section.

	Average	Range
East-west diameter	77.25 inches	50–131 inches
North-south diameter	78.00 inches	53–144 inches
Depth of pit into subsoil	15.19 inches	10½–21 inches

It will be noted that the excavation of the pits was comparatively shallow, taken from the point of view of measured penetration into the subsoil.

The amount of organic surface soil, or overburden, present when the original pit was dug was in no case ascertainable and therefore ignored. The sides and floor of all pits were smoothed and showed a definite cleavage with the fill of the pit. A hearth lens was present in only one of the four pits, as well as broken pieces of adobe bearing impressions of small branches and of beams up to 1½ inches in diameter. The question of the use of these pit structures naturally arises. When excavated they were filled with organic earth mixed with objects of culture, including sherds, rubbish, stone work, manos, etc. Pit structure 2–12 is much larger than the other three which are much of a size, about 5 feet in diameter. The three (1–12, 1–13, 3–13) seem too small for habitations in the ordinary sense, although certain rooms not much larger have been used for sleeping in some cliff houses. They are, however, commensurate in size with many structures commonly considered storage pits or chambers, and this usage seems the more likely one. After abandonment they were probably filled with rubbish.

Pit structure 2–17 is placed in a separate category because of its larger size. It was a quadrangular pit filled with organic soil and culture material at the time of our excavation. The walls of the pit sloped upward and outward from the floor in a curve of about a 10 inch radius. Both the walls and floor were fairly well smoothed and no indication of a side entrance of any sort was present. The average depth of the original excavation into the subsoil was 2¾ feet (determined by Brunton and levelling rod). No indications of a fireplace, post holes, or charred beams were discovered.

Semi-subterranean House. Fig. 3 shows the floor plan and section of pit structure 3–12 which is the most elaborate example of the pit type of structure, with the exception of the so-called kivas, located at Marysvale 7. As excavated, the remains consisted of a squarish floor of adobe plaster, averaging 3 inches thick, laid on yellow gravel. The floor itself was situated at an average depth of 40 inches below the present level of the ground and from 21 to 28 inches below the top of the gravel and mud float which forms the subsoil of the site. It should be noted that the well-worn, plastered adobe floor occupied only the central portion of the original excavation into the subsoil and sloped down to the edges, while the sides of the original pit were located from 42 to 60 inches outside the edges of the floor on all sides (Pl. Ia). Near the center of the floor was a low-rimmed fireplace filled with fine white wood ash over a thin lower coating of adobe. Penetrating this adobe coating we found, extending into the subsoil gravel, a hole 6 inches in diameter and 9 inches deep, the sides of which had been thinly plastered with adobe. A sherd and an awl were the only cultural objects in the ash fill in this hole. A post hole was found near each corner of the floor and these posts probably served as the principal supports of the roof structure. Directly north of the fireplace a group of three post holes was located and the posts implanted in them doubtless served as subsidiary interior supports. Their presence is some evidence for a flat roof which would probably require extra support along the north-south central span of at least 12½ feet, especially around the entrance hole, as shown in the tentative restoration (fig. 4).

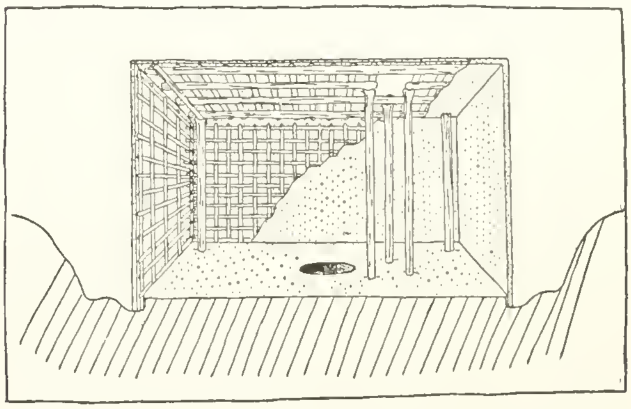

Fig. 4. Reconstruction of pit structure 3–12.

Scattered throughout the fill of this structure was a large number of wooden beams of various sizes, lying horizontally (see fig. 3 for an illustration of the best preserved specimens). In several cases burned roof adobe was found actually adhering to these beams, and, in addition, a large amount of "roof" adobe was intermingled with the fallen wood. Just outside the edges of the floor, at the point where the adobe plaster sloped off, a shallow trough occurred around all four sides and in this depression were found upright posts, at short intervals and averaging 1 inch in diameter. This situation was best represented along the east edge near the southwest corner, but such traces were found along all other edges with sufficient regularity to lead to the conclusion that the structure had been provided with upright, free-standing walls of wattle. The presence of burned adobe around the wall post-butts, indicated perhaps a daub wall of the jacal type of construction. The heavy timbers found in the fill are presumed to have been part of the supporting framework and of the roof assembly. In the northwest quadrant a considerable patch of charred, massed willow stems and corn stalks interwoven with beams was found, which may have been part of the roof. Elsewhere charred corn cobs tied by their husks to charred beams were found indicating, perhaps, seed corn which had been hung up to dry. It will be noted that certain beams were found lying at some distance outside the floor, particularly on the west side. These beams were found in the organic top soil of the site, and in many cases were inclined downward into the excavation which had been made for the house, as if they had fallen in with the collapse of the structure. These beams may represent extended eaves of the roof. At first it was thought that they might be part of an entrance passageway, but complete excavation revealed that the sides of the original excavation extended without a break all around the structure at some distance outside the floor. Fig. 4 is a sketched representation of the possible original appearance of the structure. In the absence of other evidence, it is assumed that entrance was via a roof hole.

It should be noted that the floor of pit structure 3–12 was covered by a $\frac{3}{4}$ inch layer of fine sand, above which lay the debris of wood, adobe and other parts of the superstructure. Thus it would seem that the structure stood unused for a short time before the fire which destroyed the superstructure; a circumstance which would militate against the theory that the structure caught fire from its own fireplace during normal occupation.

Kivas. Three kiva-like structures were completely excavated, and the general outlines of a fourth (pit structure 1–14) were traced. Whether these structures were actually used as ceremonial chambers will be discussed later, but for the moment it is sufficient to state that they were so designated on the field charts because they were all semi-subterranean, had central fireplaces and ventilator-like appendages resembling Steward's kivas of Kanosh.[5]

Kiva A will be found in fig. 2 at the east end of the group of structures which formed the prehistoric village. Fig. 5 shows a detailed plan and section. The original excavation was made 21 inches into the subsoil which may have been glacial drift. The floor and walls of the excavation were plastered with hard adobe 1 to 3 inches in thickness, which extended up the sides 21 inches above the floor, i.e., to the top of the subsoil. The present level of the floor is on the average 39 inches below the present surface. The wall was broken at both the southeast and southwest corners by "ventilators," (the one to the southwest being a tunnel) elsewhere the wall joined the floor in curving fashion. A fireplace with an adobe rim which averaged 6 inches wide and 3 inches high was located near the center of the floor. When Kiva A was being excavated we found the following stratigraphy in the fill from the top to the bottom:

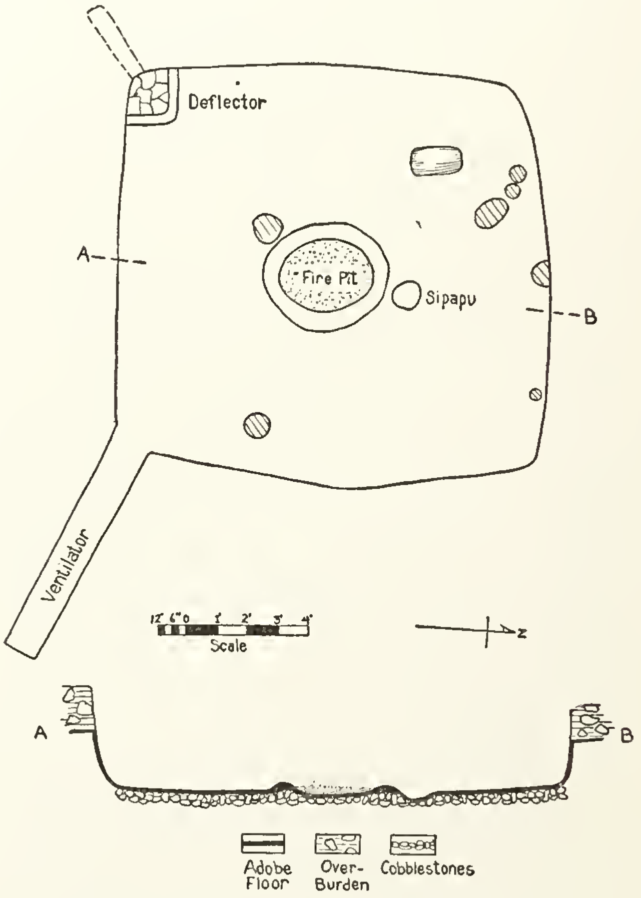

FIG. 5. MARYSVALE 7. PLAN OF KIVA A AND CROSS SECTION.

1. 18 inches of organic, culture-bearing earth, similar to the surface burden and representing dump material deposited after the abandonment of the structure.
2. 4 to 8 inches of angular stones.
3. 12 to 16 inches of red adobe lumps, seemingly from the roof or wall.

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[5] Steward, 1933a, pp. 26–30.

4. 1 to 5 inches of cultural material, overlying the floor.
5. 1 to 3 inches of adobe floor resting on layer 6.
6. 4 inches of small cobblestones.
7. Chalky gravel of the ridge.

The upper surface of the layer of red adobe lumps (3) was well consolidated as if there had been considerable walking on it and it is possible that this layer, together with the layer of stones lying above it, formed a temporary occupation level after the abandonment of the original structure. The collection was kept separated as regards that coming from above the adobe lump layer, levels 1 and 2; below it, levels 4, 5, 6.[6] No fireplace was found at the level of the adobe lumps, however, and it seems more probable that this layer represented an accumulation of fallen roof and wall material since many of the lumps bore beam impressions. The overlying layer of stones coincided with the top of the subsoil and conformed to the boundaries of the original excavation, indicating that the original excavation had perhaps been filled level with its sides, then tramped down by inhabitants passing over the abandoned site. Finally the topmost stratum, a layer of surface material including cultural material from still occupied structures, may have been deposited above the fallen wall and roof debris.

The southwestern "ventilator," in the form of a tunnel and rectangular in cross section, was dug into the subsoil. The bottom and vertical sides were plastered with adobe, while the top was timbered with small transverse sticks, 1 to 1½ inches in diameter, which were lying horizontally. This timbering extended backwards 5 feet from the entrance where the ventilator came to an abrupt plastered end. Although we were unable to locate it, it seems not improbable that a vertical extension to ground level may have risen from this end of the ventilator. The bottom sill of the ventilator was 10 inches above the floor level and the ventilator rose gradually toward the southwest. At the entrance it was 10½ inches high and 11 inches wide, almost square. On the floor in this corner were found traces of two low walls of adobe, which extended at right angles from the south and west walls and met in a right angle in front of the ventilator entrance. This detail which was better represented in Kiva B (see below) was not clear here, however. Probably this construction ("deflector") had been destroyed before the abandonment of Kiva A. The area in the southwest corner, enclosed by the traces of this wall, was paved with thin sandstone slabs.

Another opening ran diagonally off the southeast corner of Kiva A. In this case no timbering was found in place; the walls and floor of this "ventilator" were well smoothed but not plastered. No evidence of a roof occurred and the "ventilator" resembled a ditch. The bottom sill of the opening was 13 inches above the level of the floor in the southeast corner; the "ventilator" continued diagonally off the southeast corner where it came to an abrupt stop in a definite smoothed end. The average depth of the ventilator floor was 23 inches below the present surface, and the floor maintained a horizontal course about 8 inches below the top of the subsoil. The width of the entrance was 18 inches. A restorable Black-on-buff (Pl. IXc) bowl was found in this "ventilator," as well as several other cultural objects. No evidence of a deflector was found on the floor in the southeast corner. It is possible that this second "ventilator" was an entrance passageway, although the entrance sill into the "kiva" proper did not show the wear and erosion we should expect from such usage. The possibility that this was an exploration trench of some unknown archaeologist is not to be ruled out, although if this were the case, it is remarkable that no disturbance was noticeable from the surface and that the "trench" was so neatly refilled. Furthermore the fact that a somewhat similar ditch-like "ventilator" was found also running off the southeast corner of Kiva C makes this possibility most improbable and leads us to the conclusion that both features were part of the original construction of this type of kiva.

The location of post holes was irregular in Kiva A and may be seen in fig. 5. The hole just to the north of the fireplace might be considered a sipapu. It was 12 inches in diameter and 8½ inches deep, well smoothed throughout and filled with sand at the time of excavation. Due to the irregularity of the post holes it is impossible to form any definite conclusions concerning the roof structure. The presence of the following features leads one to suppose that a truncated pyramid type of superstructure was used: ample adobe with beam and willow impressions, one large post hole in the southeast quadrant, two holes at the base of the north wall with butts leaning toward the center and many large charred beams extending from the sides toward the center. The only other feature of interest is the plastered rectangular depression in the northwest quadrant, 18½ inches long, 9½ inches wide and 7 inches deep at its greatest depth. In it was found a Utah-type metate with secondary end depression. A clay figurine, found among the other objects in the fill of Kiva A, adds to the probability that it was used as a ceremonial chamber.

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[6] The differences, such as they are, will be discussed under the head of collections.

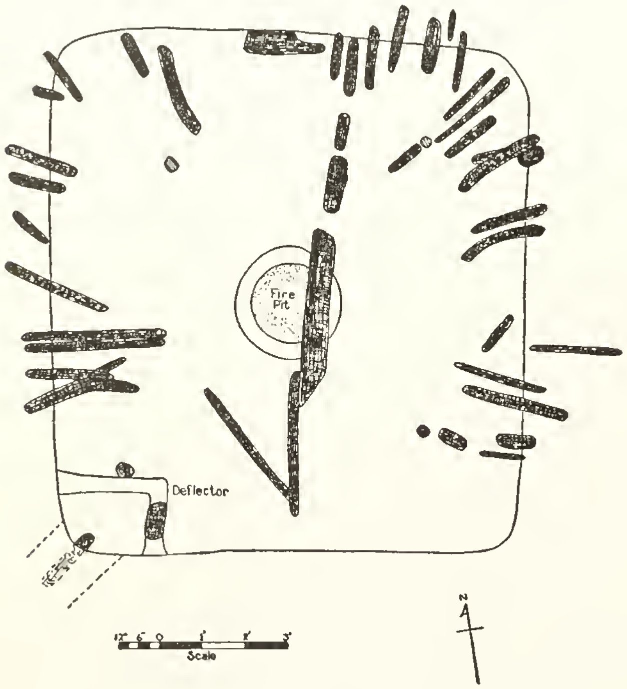

Fig. 6. Marysvale 7. Plan of Kiva B with beam pattern.

Kiva B was located at the opposite, or west. end of the village group from Kiva A (fig. 2). The plan and beam pattern of this structure are shown in fig. 6. The sides of the excavation were carefully plastered with adobe, 3 to 4 inches thick, and stood above the floor at an average height of 17.2 inches. This floor lay below the present surface at an average depth of 41.3 inches. A "deflector" occupied the southwest corner and consisted of two adobe walls projecting at right angles from the south and west walls to form a right angle on the southwest-northeast diagonal of the house. The north wall of the deflector was 32 inches long and averaged 17 inches in height, while the east wall was 17 inches long and 21 inches high. The deflector corner was 15 inches high and the average width of the deflector wall at the top was 4 inches. At the time of excavation the area behind the deflector walls and the ventilator was filled with gravel wash. The ventilator was a tunnel 18 inches wide and 16 inches high. Its top had apparently been timbered, as one large charred and eleven small beams were recovered from within the ventilator; but the flood action which had carried the gravel fill into the structure not only had disarranged the timbering, but also had destroyed nearly all of the plastered surface of the walls and the floor of the ventilator. This circumstance also made it impossible to determine just where the ventilator ended outside the structure, although its length could be traced for 2 feet from the opening.

A fireplace with a clay rim varying from 4–6 inches in width occupied the center of the floor. As shown in the plans, four vertical post holes or butts, were discovered in the floor. The southwest post end was found *in situ* abutting the north wall of the deflector and was reinforced by a collar of adobe, built up about 3 inches from the floor while the southeast post butt had no such reinforcement. The northeast and northwest posts were represented merely by holes in the floor. Thus the four main supporting posts of the structure occupied the corners of a quadrangle. Fig. 6 shows the charred beams as they were uncovered in this structure. A large amount of burned adobe, bearing beam impressions, was found inside the kiva. No positive evidence of the form of the superstructure is available other than that presented. Nothing which could be called a sipapu was found here; nor was a southeast opening or "ventilator" present, as in Kiva A.

Kiva C, a semi-subterranean structure located about 21 feet to the east of Kiva B, was larger than either of the two kivas just described (see fig. 2). Here, as on all quadrilateral structures, the depth or height of the walls was taken at each end of the four corners and at the midpoint of each of the four walls. The average measurement resulted in a depth of 22½ inches below the top of the subsoil and 34½ inches from the present ground level for Kiva C. A peculiarity of the walls of this structure was that they stood out as huge adobe slabs from the sides of the original excavation. These slabs of adobe were comparatively thin, ranging from 3 to 7 inches in thickness and for this reason, as well as the fact that they were continuous with the floor below the subsoil level, probably cannot be considered free-standing adobe walls. Yet a space of from 2 to 6 inches intervened between the back of the adobe wall material and the original cut into the subsoil. This space was filled with culture-bearing material at the time of excavation. Slightly to the west of the center of the floor, a clay fireplace, 32½ inches in its outside diameter was located. This fireplace was made in the shape of a basin, with its bottom curving upward to a thin bevelled rim, rather than the ringlike rim of adobe around a level bottom in the case of fireplaces already described for the other structures. Two post holes were found on the floor. Running off the southeast corner was an opening or "ventilator" which was rectangular in cross section. This opening was 14 feet long, 27 inches wide, 28 inches deep from the surface at the room and outer ends, and 6 inches from the top of the subsoil at the room end and 13 inches at the outer end. No evidence of top timbering or roof was found. The sides were smoothed but not plastered as in the southeast ventilator of Kiva A. Culture-bearing material filled this ventilator. No evidence of a deflector occurred here nor was there any evidence of a ventilator in any of the other corners of Kiva C.

The floor was well worn and tamped to the base of the walls, indicating that the slope of the superstructure began at such a height as to permit standing upright.[7] Roof or wall adobe with willow and beam impressions was scattered thickly through the fill from the floor to 30 inches above it. A sherd of Black-on-red ware was found near the northwest corner. Two Utah-type metates were found, one 10 inches above the floor, the other 15 inches.

Pit structure 1–14, shown southwest of House IV in fig. 2, was only partially excavated. It also was a semi-subterranean structure whose floor was 28 inches below the surface. The walls were smoothed, rather than being actually plastered and the floor, although perfectly definite, lacked a thick coating of adobe. The walls were traced to the floor on the inside, but showed definitely only on the west, north and east sides. We were able to find only the southwest, northwest and northeast corners. The peculiar configuration of the walls suggested that this structure was possibly one of the pit-type structures which had been abandoned in the process of being enlarged into a kiva-type. Complete excavation would, of course, have revealed more information, but we were convinced by test pitting before abandoning the site that the unexcavated portions held no mysteries, at least in the form of side entrance construction. A diagonal trench located a fireplace of the basin type, i.e., without a well-defined rim, near the center of the floor. It was 32 inches in diameter and at the time of excavation was covered with a mass of adobe lumps 4 inches thick. No large beams were found here, although some adobe with beam impressions was present.

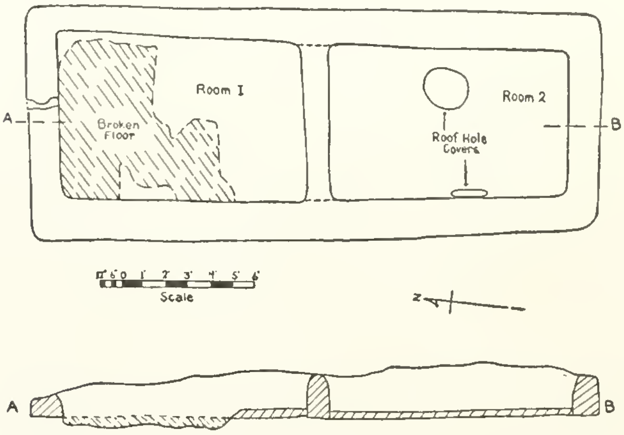

FIG. 7. MARYSVALE 7. PLAN OF HOUSE I AND CROSS SECTION.

Houses. The five houses found at Marysvale 7 had free-standing adobe walls, lacked interior fireplaces and were rectangular in plan.

House I was the most elaborate of the five structures of this type and the only one with two rooms. The long axis ran north and south as shown in the plan and cross section in fig. 7.

At the time of excavation the tops of the walls of these adobe houses were just below the present ground surface and therefore invisible. An examination of the walls of House I shows that the entire outside wall was probably built first, the interior then being subdivided by a transverse wall to create two rooms. Taking House I as a whole, the north and south end walls were the thickest, being 13 and 14 inches thick respectively. The side walls averaged 11 inches in thickness and the thickness of the partition between the two rooms was 8 inches. The walls of Room 1 stood 16½ inches high on the northwest corner to 22 inches at the southwest corner.

The floors of both rooms were of hard adobe about 2 inches thick, but that of Room 1 had for some reason been broken and destroyed in the northwest portion, as shown by the hatched area in fig. 7. Below the floor level here unconsolidated ash, charcoal and organic earth extended downward to the undisturbed subsoil at a depth of about 13 inches below the floor level.

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[7] Cf. Judd, 1926, p. 8. At Willard lack of wear on the floor away from the fireplace is held to indicate a low sloping superstructure.

A stratigraphic trench (Trench 18) was cut to connect the northeast corner of House I with the southwest corner of pit structure 3–12 (see fig. 8). This showed that the floor and walls of House I rested on 9 to 13 inches of culture-bearing material overlying the subsoil. Three strata were present in the deposit: first, the surface stratum of culture-bearing soil or rubbish, second a stratum of chalky glacial drift and third a stratum of reddish, water-worn gravel. House I was built in and on the stratum of surface rubbish which underlies the floor of the house.[8] The floor of pit structure 3–12 was laid directly on the gravel stratum and the excavation was filled with rubbish material.

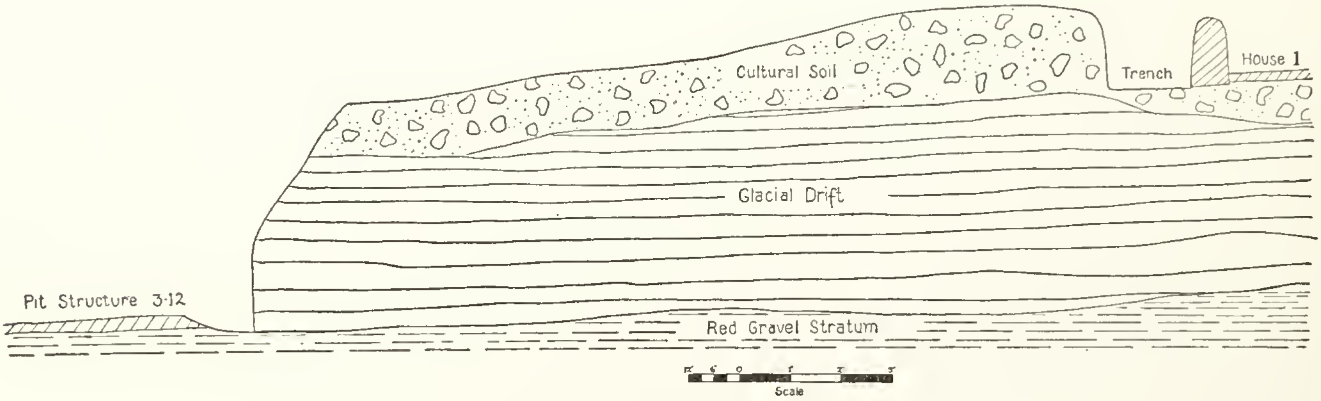

FIG. 8. MARYSVALE 7. CROSS SECTION OF TRENCH 18.

A Utah-type metate was found in Room 1, separated by 3 inches of debris from the floor. The interiors of both rooms were filled with fallen lumps of adobe, sherds, manos and other artifacts. A few pieces of very small charcoal occurred and the dusty red traces of decayed wood (probably beams). Several large charred beams were also found in each room indicating that the house was probably burned. This looks more like a case of deliberate arson than the burning of the other structures containing interior fireplaces.

The floor of Room 2 was 3 inches lower where it joined the partition than the floor of Room 1 on the other side. A small rectangular depression of the floor occurred in the southeast corner, measuring 12 inches north-south, 8 inches east-west and $2\frac{1}{2}$ inches at the greatest depth. The floor was smoothed off at the edges, showing that the depression was present while the house was in use. It may have been an emplacement for a metate. Two disks of sandstone (roof hole covers) were found in Room 2. The first disk, which measured 20 inches in diameter and 2 inches thick, was lying horizontally 9 inches above the floor. The second was leaning against the west wall and measured 21 to $25\frac{1}{2}$ inches in diameter and $1\frac{1}{2}$ inches thick. Since the walls of neither of these rooms had doors, it was assumed that both rooms had separate entrances through their respective roofs. One of these roof hole covers probably belonged to Room 1 since none was found in that room.

House II was situated farthest north of any structure in the group. Its walls were very thick and rounded in the corners, especially in the northeast corner. The floor was of adobe, but poorly defined. A disk of sandstone (roof hole cover) was found 8 inches above the floor and measured 17 to $19\frac{1}{4}$ inches in diameter and $2\frac{1}{2}$ inches thick. A slab with a grinding surface was found leaning on edge against the west wall and also several manos came from this house. Near the west end, on the floor, a complete, unbroken gray pitcher was found.

House III was located about 60 feet to the southwest of House I and overlooked the steep southern slope of the ridge. The average height of the walls when excavated was 16 inches with a range from $6\frac{1}{2}$ to 23 inches. No roof hole cover

[8] Dirt samples from the wall of House I, the hardpan 12 inches below the house wall and the surface drift 15 inches above the base of the wall were submitted to Dr. B. C. Freeman of the Geology Department of Ohio State University. Dr. Freeman reported that he was unable to determine the relative ages of the samples by microscopic or mineralogical evidence.

was found in this house, but one which was lying on the surface about 10 feet east may have belonged to this structure. It measured from 19 to 23 inches in diameter and was 2½ inches thick.

House IV was located to the northwest of House I. The walls averaged 10 inches in height with a range from 8 to 10 inches. A rectangular sandstone slab, 22 inches long, 15 inches wide and 2 inches thick, presumably the roof hole cover, was found in the house. A rectangular depression of the floor occupied the northeast corner, measuring 21 inches east-west, 16 inches north-south and 6 inches deep. The edges were smoothed and probably represented an emplacement for a metate as in House I, Room 2.

House V, located to the west of House III and also on the brow of the ridge, was the least well preserved of the adobe houses, perhaps due to its exposed position. The east wall was barely discernible and was almost reduced to floor level in the southeast corner. It began to rise 51 inches north of the southeast corner and averaged 2 to 3 inches from there to the northeast corner. Neither roof hole cover nor interior furniture were found in this house.

MARYSVALE 1

Marysvale 1 was located to the north of the George Henry ranch house, three-fourths of a mile northwest of Marysvale in an uncultivated forty acre field covered with sage brush. Sherds and chips were found sporadically scattered in small numbers over this entire field, but no indication of former habitations.

Before excavation the site appeared as a group of rocks, seemingly aligned as if to represent the fallen walls of a three room, unit type house. The site was not elevated above the general level of the field and a considerable amount of sherds was scattered about the surface. Excavation, however, showed that the supposed walls did not extend below the surface of the ground and that the rocks were much more irregularly placed than had been apparent from the surface. Furthermore, there was no floor inside the supposed houses. Following the clearing of the rocks, five test pits, each about 2½ feet in diameter, were sunk. In each case, a stratum of sandy gravel float containing large irregular rocks extended for about 12 inches below the surface. Plain yellow sand lay below this for 18 inches and indefinitely deeper. No cultural material was found in any of the pits. Thus it may be concluded from the above facts that Marysvale 1 was not a habitation site.

Old residents of the region say that this part of the valley, before being brought into cultivation, had supported perhaps a dozen mounds. Memories vary on this point, however. Of these the Marysvale 3 mound was the only one left. No one remembered any mounds in the field of site 1, however, nor did our examination indicate that a former mound existed here. Signs of former flood action were visible over the surface of this and adjoining ground and it seemed that the surface sherds may have been washed in from a site or sites higher up on the mountain slope to the west. Therefore, a reconnaissance party of four men was sent up the slope of the mountains covering the immediate drainage basin above the flat. Neither sites nor specimens were found after a thorough search, so we have tentatively concluded that the surface sherds of Marysvale 1 owe their origin to the mound sites, of which Marysvale 3 is the sole remaining representative.

CLEAR CREEK CANYON CAVE

The pictographs in this canyon have been mentioned by Judd.[9] A cave was located on the south side of the canyon by Mr. Elmer Smith about 40 feet above the creek, on the property of Mr. Ralph Ross, about 6½ miles from the mouth of Clear Creek Canyon. The cave measured 18 feet wide, 16 feet deep and about 6½ feet from the top of the deposit to the roof. The feature which attracted our attention to this cave was the presence of twenty-three hands silhouetted in red and orange paint on the rear wall of the cave, and also some irregular lines and blotches in red paint.

Shallow amateur excavation had been attempted here previous to Smith's inspection. A trench 27 inches wide was sunk through untouched deposits from the rear wall of the cave. The total length of the trench (which was carried out beyond the overhang of the cave to the drop-off of the slope) was 20½ feet. Throughout its length it was carried down to rock level. The rock floor sloped beneath the fill downward from the back toward the front of the cave. The upper part of the fill consisted of regular, wind-blown sand which contained no indications of human life and ranged from 4 feet 2 inches to

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[9] Judd, 1926, p. 65.

5 feet 1 inch in depth, proceeding from the back to the front of the cave. Below this was a stratum containing wind-blown sand mixed with charcoal and averaging about 24 inches in thickness. Near the bottom of the charcoal and sand layer the charcoal became thicker, but in no place was it well consolidated. A bone awl, the only artifact removed from the cave, was located 61 inches from the surface of the deposit and 31 inches from the back wall of the cave, thus placing it toward the bottom of the charcoal and sand stratum. A red painted hand was located 24 inches below the present surface of the deposit on the back wall of the cave, as well as indications of other weathered pictographs, impossible to distinguish. Below the charcoal and sand deposit occurred a layer of irregular rock slabs and below this the bed rock. This stratification showed the original floor of the cave (represented by the bedrock) covered with slabs fallen from the roof. The charcoal above this, scattered and sparse, seemed to indicate that the cave was used only as a campsite. After the abandonment of the cave, wind-blown sand mixed with the charcoal was deposited for a time, then for a considerable period wind deposition continued after all loose charcoal had been imbedded in sand.

Skinner's Canyon Petrographs

About 3½ miles west of the mouth of Clear Creek Canyon is the north tributary canyon, known as Skinner's. A flat-bottomed mano, a Utah-type metate and several pictographs comprised the evidences of early man. No signs of permanent habitations were visible.

Sevier Petrographs and House Sites

On the west side of the Sevier River, 600 feet west of the Denver, Rio Grande and Western railroad tracks and 900 feet north of the Sevier station, a number of pictographs were located on a group of rocks. A short distance to the north of the pictographs two low mound sites were situated. Plain grey sherds, a broken stone roof hole cover and lumps of adobe, all on the surface, indicated these to represent probable habitation sites. They were not excavated for lack of time.

Manning and Dry Creek Canyon Petrographs

Manning Canyon is about 8 miles south of Marysvale on the east side of the Sevier River. A series of petroglyphs was found on the north side of the canyon about one-half mile east of its mouth. Dry Creek Canyon, also on the east side of the Sevier River and somewhat north of Manning, also showed a group of petroglyphs on its north side just inside its mouth. The designs seem to be typically Pueblo with the exception of a very crudely pecked and obviously recent figure of a man with a horse. Incised designs include (to use Steward's terminology[10]), the "rake" or "rain" figure, "ladder," "circle chains," "mountain sheep" with crescent bodies, "zig-zag" spirals, "wheel" with 4 spokes and a square with a single dot in the center. Nowhere were horned dancers of the Fremont type, pictured by Morss, noted in either pictographs or petroglyphs of this area.

SITES NEAR EPHRAIM

Ephraim 1

This site, locally known as Witch's Knoll, was located about 3 miles southeast of the town of Ephraim and rose about 60 feet above the level of the valley floor. Its north-south length was about 735 feet and its east-west length about 600 feet.

Mr. Elmer Smith, formerly of Snow College at Ephraim and now of the University of Utah, had investigated this site in 1935 for the University of Utah prior to the author's connection with that Institution. The following description is quoted from his report on the site.[11]

> The site covers all of the knoll and extends into the valley to the east. The early settlers of Ephraim state that much of the farm land near the knoll was covered with mounds of like type. There are at least 14 different mounds making up the site. The mounds average about 18 by 15 feet. . . . Some of these mounds were void of vegetation, others were covered by a scanty growth of sage brush. Pottery is scattered over a wide surface area, as well as metates, manos, flints, and arrow points. Many of the mounds have been "pot-hunted."
>
> Excavation I was begun as a clearing-out project of some debris made by "pot-hunters" in one of the mounds. After much of the dirt had been cleaned out of a "pot-hunter's" trench, metates were encountered slightly to the west of the original trench . . . at a depth of 22½ inches. Pottery was found closely associated with the metates and on the same level. . . . Further excavation proved that all the wall except about a third of the west side had been destroyed by vandalism and very little could be learned from the wrecked remains.

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[10] Steward, 1929.

[11] Smith, unpublished report.

Smith gives no data on the form of the room, but states the stratification in Excavation I as follows:

> First 2½ feet from surface, surface debris; stratum below this 22 inches deep, ashes, charcoal, clay, pottery; stratum below this 1½ thick of dark charcoal. This excavation was on the southwest side of the knoll.
>
> Excavation II was located 9½ feet to the south of Excavation I. It, like Excavation I, had been partly destroyed by pot-hunters to a depth of 19 inches, and several metates had been partly destroyed by pot-hunters and thrown out. By careful excavation, pieces of charcoal, beams or poles were found, running in the general direction of east-west while the smaller ones beneath the larger poles were running in the general north-south direction. Smaller beams were also nearer the floor. The walls were of sandstone slabs stood on end built up with adobe and stone. The slab "base-boards" averaged 22 inches high and 2½ inches thick. The floor was of adobe or hard clay with a mixture of small pebbles, and was found 21 to 25 inches below the surface of the ground; beneath the floor was a hardpan of greyish clay. . . . The room measured 6 feet long and at the south end was 20 inches wide and 21 inches deep, at the north end 24 inches wide and 25 inches deep.
>
> Excavation III was located on the eastern slope of Witch's Knoll near the base of the hill. The mound was covered with sage-brush and cactus, but when cleared, measured 27 feet north-south by 30 feet east-west. A large amount of pottery was found 8 inches beneath the surface and slightly to the north-east of the middle of the mound. Charcoal was very heavy around and under the pot-sherds. The adobe was very thick and hard in the area dug, but at about 5 inches below the surface, an adobe wall was found. The wall was then followed downward to a depth of 43 inches but no floor was found. However, at a depth of 34 inches a break in the wall was encountered.[12]

It was decided that our party should attempt as thorough an excavation of several houses at this site as time allowed in order to obtain as complete information as possible of the types suggested by Smith's report.

House I (Pl. Id) was a slab house of the type of Smith's Excavation II and the only rectangular slab house in addition to Excavation II which we located from the surface. Small trenches on fig. 9 represent our attempts to locate slab houses elsewhere on this site.[13]

The edges of the slabs of House 1 showed above the surface, but excavation proved that the house was partially destroyed. The inside measurements of the wall were: 12 feet 5 inches, north; 5 feet 7 inches, east; 12 feet 4 inches, south; 6 feet 6 inches, west. About 1 inch below the surface the top of a stratum, which was composde of burned beams and roof adobe and extended to the floor, was found. A floor of hard-packed clay lay at a depth of 13 inches in the southwest corner, 11 inches in the middle of the west wall and 12 inches in the northwest corner, below the tops of the protruding slabs which measured 1 inch thick and about 12 inches square. In the east side of the house the floor and wall were partially destroyed. The verticality of the walls was deduced from the proximity of two post holes, found in the southwest and northeast corners, to the walls. The southwest post hole was 10 inches deep and 8 inches in diameter and the northwest hole was 18 inches deep, 10 inches in diameter, 1 inch from the west wall and 5 inches from the north wall. It seems likely, however, that originally two post holes occupied the northeast and southeast corners in a complementary fashion to those already described and that these four posts held up a flat roof. The pattern of large and small beams described by Smith for Excavation II plus the large amounts of adobe, bearing beam impressions, in both houses indicated that the walls and roof were both of adobe applied over a wattle frame reinforced with heavy beams. Beyond this the available information does not allow us to reconstruct this type of structure. As there was no definite information concerning the entrance, we therefore have postulated a roof entrance. No fireplace was present in this house.

In conclusion, Smith's excavations and those of the present expedition seem to show that there existed here a rectangular slab house of small dimensions. The house was semi-subterranean in the respect that the floor was sunk a foot or so below the surface, and the possibility of vertical walls of adobe and wattle and a flat roof supported by four interior posts near the corners complete the picture.

House VI showed certain characteristics which may indicate a typological development of the slab house. As it stood, House VI consisted of two rooms. The long axis of the house ran northwest-southeast, but we shall speak of the "north" wall, etc., and reference to fig. 10 will make our description clear. The smallest room, Room 1, was not in a good state of preservation.

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[12] This excavation, called House IV in the present report, was reopened and the adobe wall was followed further by members of the present expedition. The investigation was stopped after a short time as the house

[13] It is possible that further extensive trenching operations at Ephraim I would locate further examples and clear up some of the vague points.

occupied the west end of the house and was superimposed on an earlier structure, the floor of which lay 11 inches below the floor and wall bases of the upper structure. The walls stood at an average of 31 inches above the floor, ranging from 22 inches in the southwest corner to 32 inches in the northeast corner, and averaged 9 inches in thickness, the partition wall being generally of the same thickness. The floor was of hard adobe, about 2 inches thick, and immediately under the floor was a paving of thin shale slabs. Under the paving a cultural stratum, containing charcoal, sherds and bone was encountered to a depth of 11 inches below the floor surface. Below this lay a cultural soil of slightly different appearance, 3½ inches thick, harder than the stratum above, but also containing charcoal and sherds. It was thought that this second stratum represented the floor of an earlier structure, the other features of which could not be located. Sterile hardpan was reached at a depth of 14½ inches below the surface of the floor. The same situation was present in Room 2, with the exception that the floor of the lower structure (?) faded out about 2 feet from the east wall of Room 2. Probably the earlier structure had been destroyed and a new house (House VI) built above it. The walls of House VI did not extend below the shale paving already mentioned.

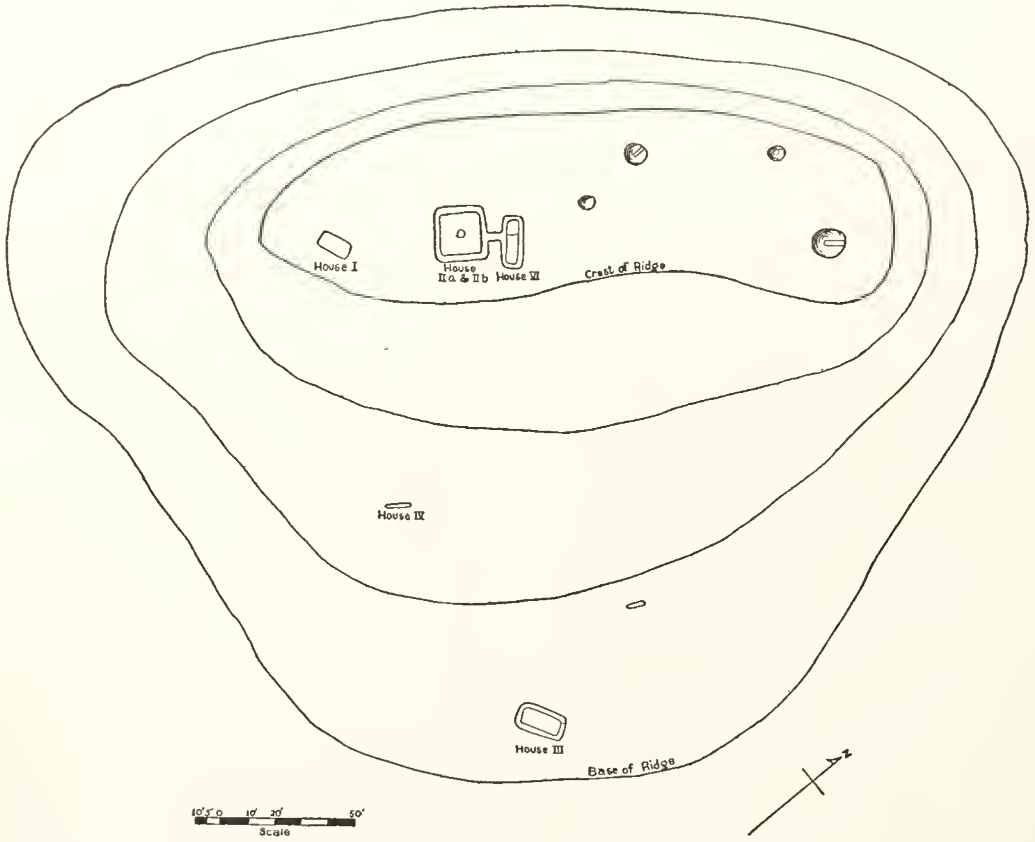

Fig. 9. Ephraim I. Plan of excavation.

The walls of Room 2 were of large courses of adobe, clearly defined and hard. The feature of the walls which indicated possible typological connection with the rectangular slab-house type was the presence of slabs. Only one of these, 13 inches in diameter, was found in place adhering to the base of the north wall of the house. Several other slabs of this sort, fallen on the floor, were found within this room. It is possible that these slabs lined the entire inside of the walls—a skeuomorphic survival of the slab pit house type.

No fireplaces were located in House VI, nor any evidence of doorways. The fill contained broken pottery and other artifacts, plus a few traces of decayed, but not charred, wood which, of course, was in no condition to be preserved for dating purposes. This last fact indicated that the house was not destroyed by fire, although the presence of charcoal on the sub-floor suggests that the earlier structure had in all probability met such a fate.

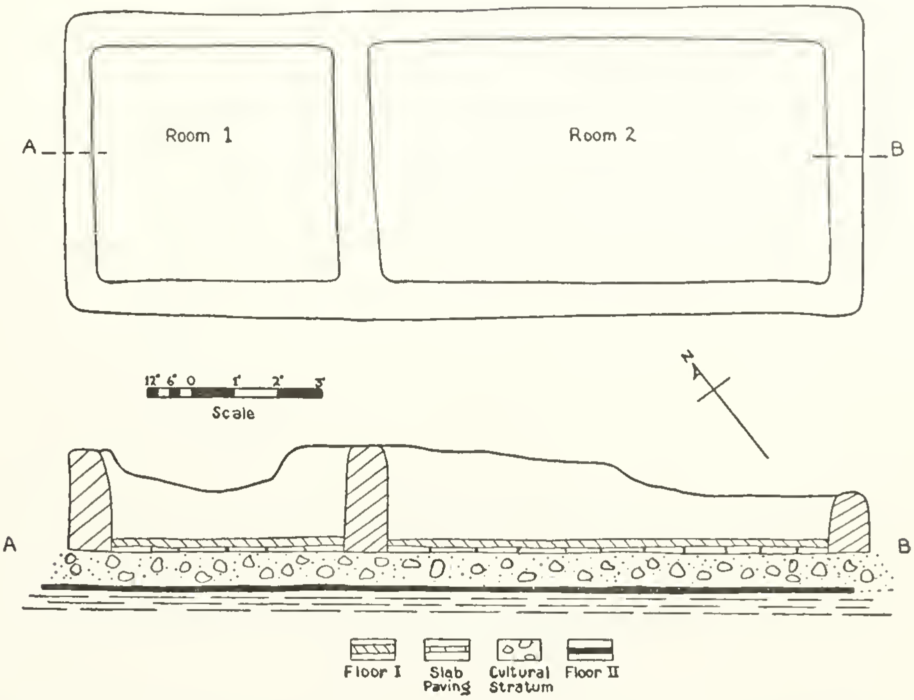

Fig. 10. Ephraim 1. Plan of House VI and west profile of N.E. wall.

House III had coursed, free-standing adobe walls, which stood higher than those of any other structures excavated by the party during the entire season. This may partially be due to the location of the structure on the lower east slope of Witch's Knoll where gentle flood action deposited protective material around and over the walls. Fig. 11 represents a picture of the variations in wall height in the west wall. A large flat slab (roof hole cover) was found in horizontal position 22 inches below the surface, 13 inches from the west wall and 52 inches from the north wall, possibly an indication of a roof entrance in the northwest quadrant. A peculiarity of House III must now be mentioned. As will be seen in fig. 11, the bases of the walls rested on a culture stratum about 12 inches thick, lying between the bottoms of the walls and the subsoil. This layer was made up of fine gray wood ash, contained bits of charcoal and extended under the walls in all directions for a distance of from 4 to 6 inches outside the walls. About a foot above the upper surface of the gray stratum (habitation floor) a stratum of decayed wood was found throughout the fill of the house. This doubtless represented the roof which was not burned, for above this stratum in the fill occurred a thick layer of broken, unburned roof adobe. Below the layer of gray culture material was a shallow, but well consolidated, layer of angular stones imbedded in and resting on the hardpan. No hard adobe floor occurred inside the house above the hardpan. It

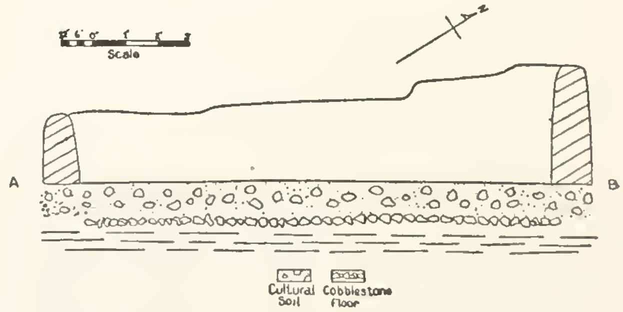

Fig. 11. Ephraim 1. Plan of House III cross section and profile of west wall.

must be concluded, therefore, that this site was covered with a subfloor of stones.[14] No fireplace was found in House III.

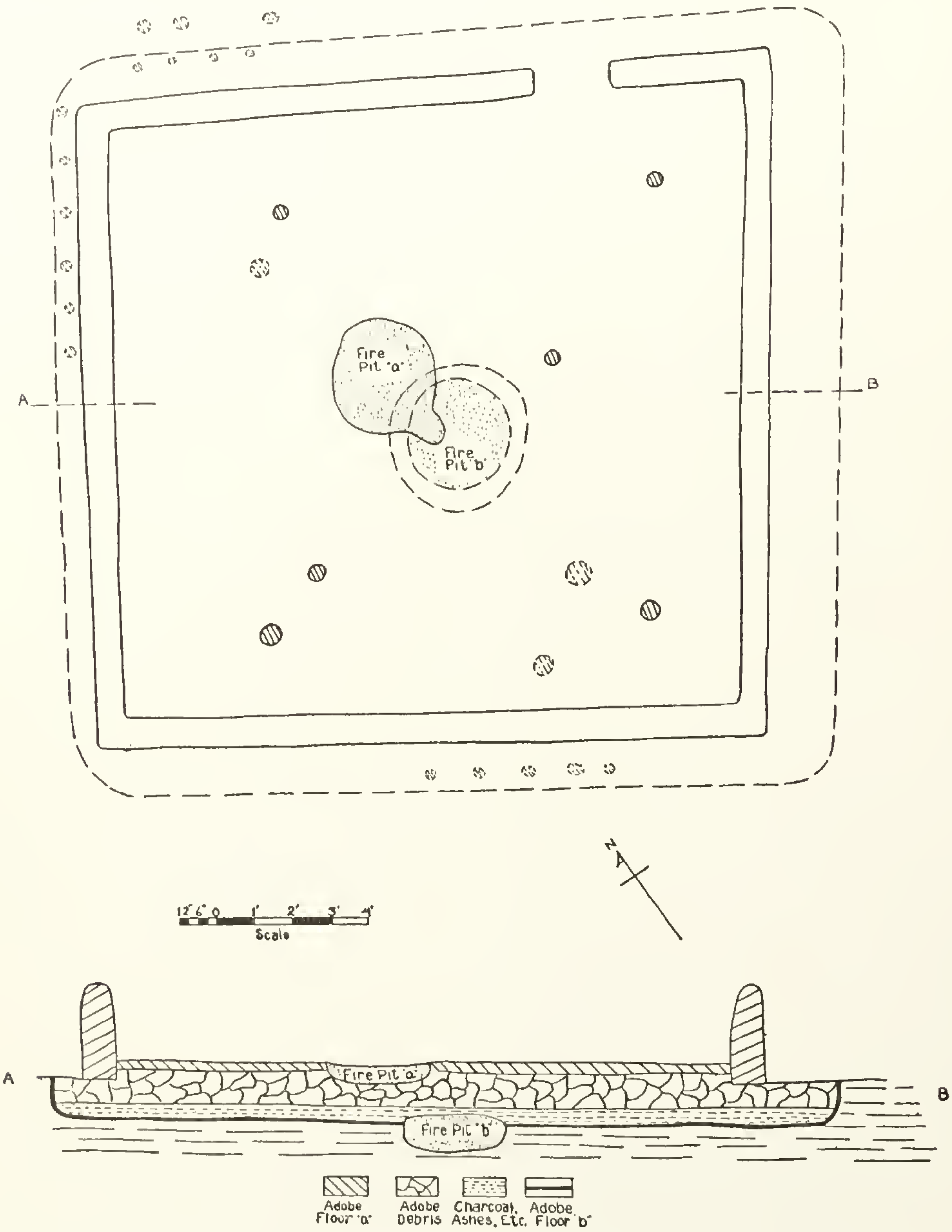

FIG. 12. EPHRAIM 1. PLAN OF HOUSES IIA AND IIB AND CROSS SECTION. SOLID LINES AND DOTTED HOLES IIA, DOTTED LINES AND CROSS HATCHED HOLES IIB.

House IIa had free-standing adobe walls of hard texture laid up in courses and superimposed on a larger pit structure (House IIb, fig. 12). The walls averaged 9 inches in thickness and 31 inches in height above the floor. The floor itself was of hard adobe about 2 inches thick and contained a rimless fireplace located slightly off the center of the floor toward the north corner. The floor was well preserved and it is doubtful that any floor holes had been present other than the two set towards the north and south corners respectively which probably originally contained posts supporting the roof. The north hole had a diameter of 5 inches and a depth of 21 inches and the south hole had a diameter of 7 inches and a depth of 8 inches. Another hole in the south part of the floor, while possibly a post hole, more probably was a cache for two effigy-like figures found in it. One of these was of adobe, molded and punched. The other was a slab of pink sandstone covered on one side with fugitive red and had a scratched band across the top of the other surface. Two sherds also occurred in this hole. A flat roof of wood and adobe is postulated, which required interior support over an area of the size represented by this room. The strain put on a roof of this size would probably preclude entrance through the roof. At any rate, a well-defined doorway was found in the northeast wall. The sill was raised about 17 inches above the level of the floor. The walls stood 33 inches high at the doorway and were smoothed off at the ends. Only fragments of decayed wood were found in this house, indicating that it was not destroyed by fire. A large amount of "roof" adobe was included in the fill.

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[14] Compare Marysvale 7, Kiva A. Also reported near Beaver, see Judd, 1926, p. 23, and p. 70 for Paragonah, Deseret, Fillmore.

House IIb was built outside the outline of House IIa, the remains of which lay directly above it. The relationship of these two structures to each other will be discussed in a later section, after a description of the characteristics of House IIb. This house was a semi-subterranean structure, oriented to the same directions as House IIa. The floor and sides of the excavation were covered with a coat of plaster. A clay-rimmed fireplace was located approximately in the center of the floor (as shown by the dotted lines in fig. 12). The rim averaged 3 inches in height off the floor. The firepit was 11 inches deep and was filled with gray wood ashes. Six post holes were present in the floor, four of them located near the four corners of the house, and two closer to the fireplace on the east-west diagonal of the house. (the post holes of House IIb are cross hatched in fig. 12). A large amount of roof and wall adobe occurred in the fill, lying on top of large charred beams, which in turn overlay a thin stratum of small charred beams lying directly on the floor. Six large loose charred beams were found piled against the southwest wall of House IIb with their axes lying parallel to this wall, as if they had been placed there by human agency to get them out of the way. No roof hole cover was found here. Although it could easily have disappeared in the building of House IIa, there is probability of a side entrance near the north corner. As shown in fig. 12, three large inclined post butts were discovered at an average of 6 inches outside the northeast rim of the original House IIb excavation near the north corner. These posts were set 10–12 inches into the ground and averaged 5 inches in diameter. They were inclined toward the excavation of the pit house as if originally they had formed a part of the sloping structure of an entrance passageway. Furthermore, four vertical posts which averaged 3 inches in diameter were found inside the House IIb excavation directly abutting against its northeast side near the north corner. They extended an average of 4 inches below the floor of House IIb.

In 1938 Professor Elmer Smith and Mr. Carling Malouf of the University of Utah returned to the site at the writer's request to examine the condition of affairs underlying the northwest wall of House IIa, which the 1937 expedition had not removed. Messrs. Smith and Malouf removed the standing wall of the upper structure and located six upright posts, averaging 3 inches in diameter abutting on the northwest wall of the lower pit house structure (House IIb) and extending from the north corner at intervals of from 12 inches to 14 inches apart, as shown in fig. 12. These posts also penetrated the floor level of the pit house some 3–4 inches. Another group of small upright posts occurred along the southwest wall of the structure as shown in fig. 12. The upright posts thus found in place in association with three sides of the pit house excavation were probably part of the original wall, which may have been vertical. No adobe was clinging to any of these upright posts when discovered but this may have been due to the demolition of House IIb preparatory to the building of House IIa upon its foundations.

The floor of IIb was an average of 17 inches below that of House IIa. Careful excavation showed that the fallen roof and wall adobe of the earlier house had undoubtedly been levelled before the erection of the walls and laying of the floor of the upper house. No layer of sand or other sterile material occurred between the two structures. The floor of House IIa rested directly on the levelled adobe debris of House IIb, indicating that little if any time intervened between the razing of the earlier house and the building of the later one.

An exploration trench 6 feet long was sunk between House IIa and House VI, Room 1. The hardpan, which was shaley rock, sloped upward toward House VI. Without confusing the exposition with a series of datum figures, the information gleaned from this trench may be summarized as follows: House IIb at this point was dug 12 inches into the hardpan. The northeast wall of House IIa rested on a level corresponding to the upper surface of the hardpan, although it rested actually on levelled adobe debris of House IIb. The floor of House IIa where cut by our trench was 10 inches above the floor of House IIb. The subfloor of House VI rested directly on the hardpan, although at an absolute level 4 inches higher than the level of the base of the northeast wall of House IIa, due to the upward slope of the hardpan surface. The floor of House VI, Room 1, was 10 inches higher than the floor of IIa, although 14½ inches above the surface of the hardpan. No stratification or bedding of the fill in the stratigraphic section was noted. It seemed to be composed of debris thrown out from the houses. Trenches around the walls of the two houses confirmed the findings just mentioned. In summary the evidence thus obtained would indicate that House IIb antedated House IIa; that House IIa and the sub-house of VI were contemporaneous, in the sense that they bear the same relation to the underlying hardpan; and that House VI (standing) was built subsequent to House IIa.

Ephraim 2

Ephraim 2 was a small surface site, located about 1 mile southeast of the entrance to Ephraim Canyon on a small rise. Pottery, manos and metates were found on the surface. The trenching of the site to the hardpan, reached at 2 to 3 feet, revealed no walls or sub-surface indications, and it was concluded that the site represented a camp site in the open. Pottery and flints scattered along the ridge which runs parallel to the road going into Ephraim Canyon apparently represent open camp sites, as test pits and trenches in this ridge revealed nothing of a permanent nature, other than the rectangular slab houses, Ephraim 3, higher up the canyon.

Ephraim 3

Another example of the rectangular slab house had been located and excavated by Elmer Smith at Ephraim 3. This site is located on the south side of Ephraim Canyon about 1 mile east of its mouth. The house, the only structure which Smith or our party was able to locate in the vicinity, was built on the north side of a spur of the hill, overlooking Ephraim Canyon. The inside measurements were: south wall, 5 feet 2 inches; north wall, 5 feet 1 inch; west wall, 9 feet 7 inches; east wall, 9 feet 6 inches. The south wall was composed of one long and one short slab, the east wall of six short slabs, the west wall of five slabs and the north wall of four slabs. The floor of adobe which was not well preserved here ranged from 10 to 12 inches below the ground surface. No culture material was found inside this house, nor any indications of post holes. The interior was filled with gravel wash from the hillside at the time of excavation.

SITES NEAR TOOELE

Tooele 1

While excavating with a steam shovel for the entrance to the Elton Tunnel on the property of the International Smelting and Refining Company in April, 1937, employees of the contractor exhumed a brachycephalic, occipitally deformed skull from 8 feet below the surface in sand which was described as an offshore beach of former Lake Bonneville by Professor C. G. Crawford of the University of Utah. The author was called upon to determine the age and characteristics which corresponded to the Pueblo skulls as they are known from numerous sites in the Southwest. Due to the fact that it was impossible to establish with certainty the exact location of the find and its direct association with the alleged Bonneville sands, nothing further could be done about the skull find except to advise the steam shovel crew and to await further finds which did not materialize. From the scanty information available concerning the find, the writer believed that it represented an intrusive Pueblo burial. With this in mind a search was made of the surrounding territory for the location of a neighboring Pueblo site. The search was rewarded in the shape of a scattering of metates and sherds on the surface, about one quarter mile north of the entrance to the tunnel and also on the Company land.

The writer began excavations in the middle of April with the help of the students of his class in Southwestern archaeology. The work was continued on Saturdays for five weeks by which time House I had been completely excavated. The Peabody Museum-University of Utah Expedition returned to this site for a week during the middle of June in order to complete the investigation of the area surrounding House I and to locate, if possible, other structures.

The land was in pasture at the time of the excavation but had been plowed and sown to grain several times and the sheared surface left by the plow could still be observed on the tops of the walls when they were excavated. A 6 inch layer of organic earth and sand, containing relatively few artifacts covered the site, probably representing the extent of surface cultivation by a plow.

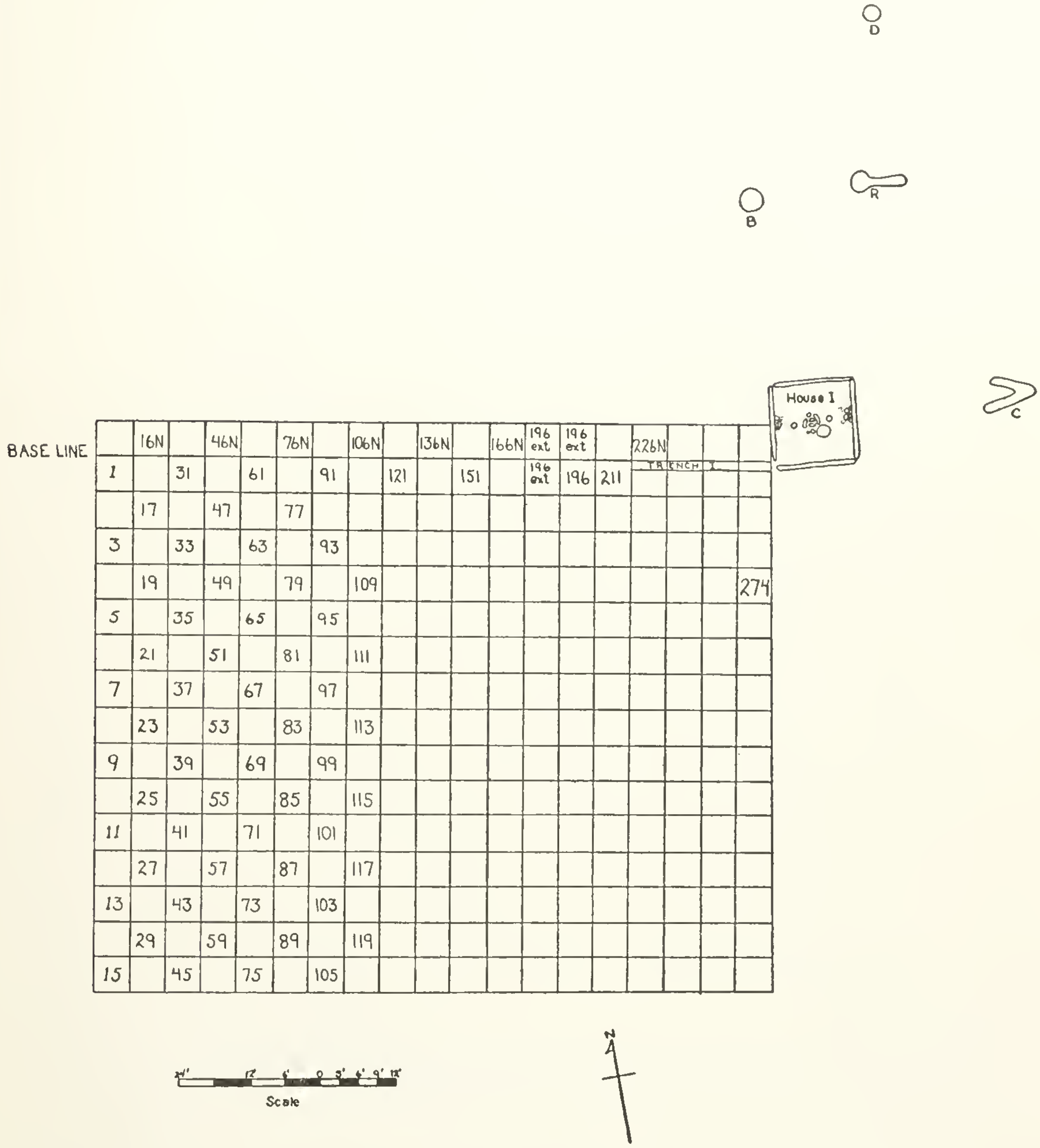

Fig. 13. Tooele 1. Plan of excavation.

House I (fig. 14) was situated on the south bank of an east-west running arroyo, now dry, 130 feet from its bed and about 20 feet above it. It was an adobe-walled structure and was the farthest north a ruin of this sort, square in shape and with interior fireplace, had been found, although a rectangular structure with free-standing adobe walls had been found by Steward at Willard.[15]

The free-standing adobe walls, which averaged 8 inches thick, stood about 28 inches above the habitation floor, 34 inches above the sandy hardpan when excavated, and their tops, which had been sheared off by the plow, reached to within

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[15] Steward, 1933a, pp. 7–9.

6 inches of the present surface. The walls were laid up in the form of irregular lumps with the surfaces plastered rather than in the form of horizontal courses, but the adobe was hard and well made.

A layer of unconsolidated culture-bearing earth averaging 8 inches thick directly overlay the surface of the hardpan and underlay the bases of the walls as was the case with Ephraim 1, House III. The top of the layer presented a firmly tamped surface, probably resulting from use. A clay-rimmed, stone paved fireplace was located near the center of the habitation floor (8 inches above the hardpan). The rim which was 5 to 6 inches thick was circular in cross section and cleaved away from the material of the floor; apparently it had been fashioned separately and laid in place. The fireplace was paved with two large slabs and six smaller ones. One of the large slabs proved to be a Utah-type metate, turned upside down. This indicated beyond much doubt that the house, or at least the fireplace, was built by people who had been previously settled in the region. The stone paving was plastered together with adobe which also covered the inside of the rim. A layer of gray ash 3 inches thick covered the paving.

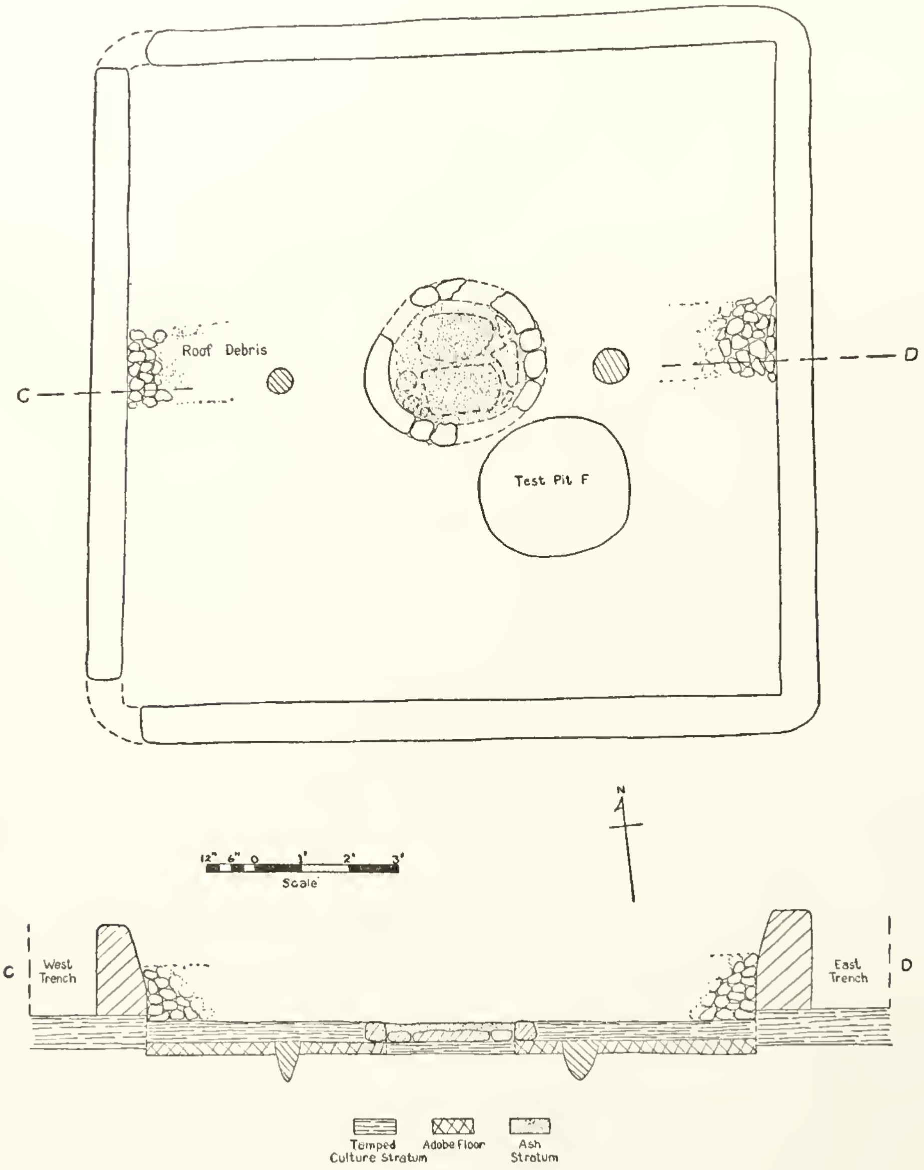

Fig. 14. Tooele 1. Plan of House I and cross section.

Two post holes were located at a distance of about 10 inches to the east and west of the fireplace respectively. The west hole contained a decayed, but not charred, wooden stump. The house had not been burned, as shown by the total absence of charred beams or any but fireplace charcoal, but the wood of the roof had doubtless decayed after the collapse. The fact that wood was used in the roof was proved by the presence of broken roof adobe, bearing beam impressions, found in the fill of the house. Evidence that the two posts were the central roof supports was furnished by the great concentration of roof adobe which lay in a veritable ridge along the east-west line in the interior of the house, as if the central supporting posts had rotted away and collapsed, thus allowing a flat roof to fall inward onto the fireplace and floor. The remaining fill of the house interior consisted of large lumps of adobe, for the most part lacking the beam impressions which were present in the central ridge of adobe. This plain adobe was therefore considered to be from the walls and mixed with this was a considerable amount of organic earth, pottery sherds and other artifacts. No roof hole covering slab was found, but in the absence of doors in the wall, a roof entrance is assumed.

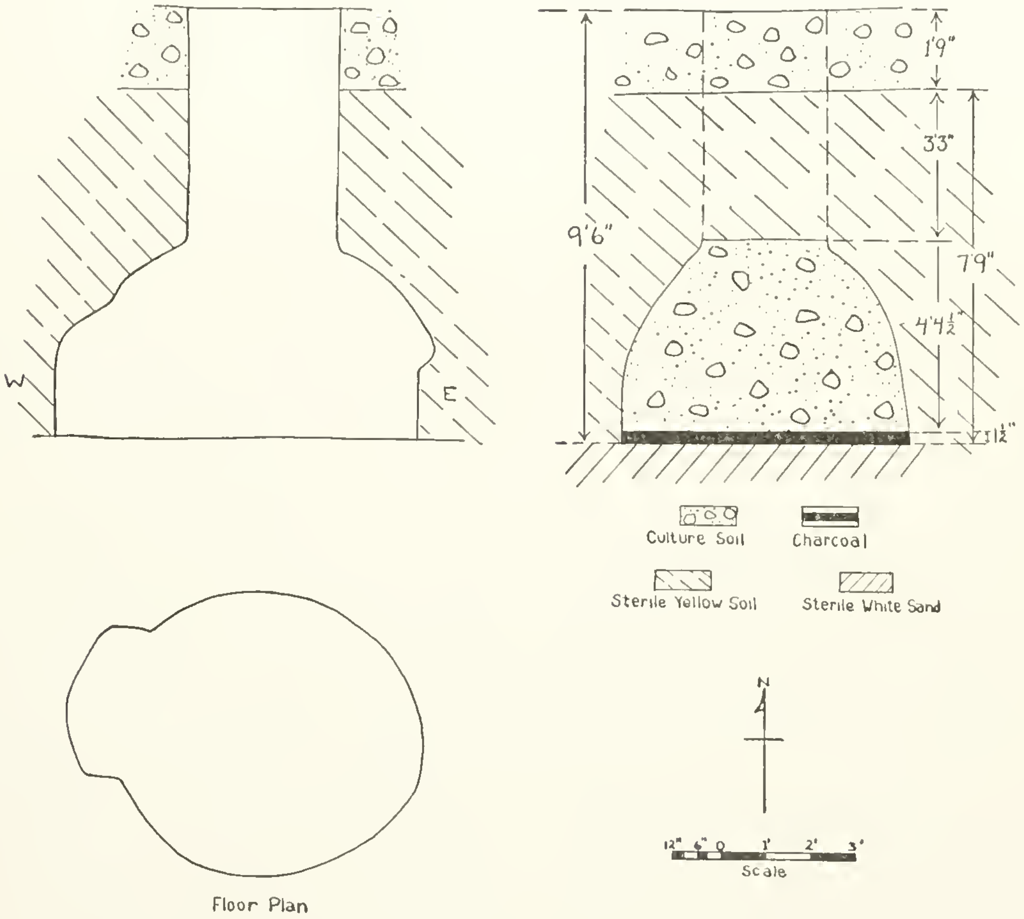

Fig. 15. Tooele 1. Plan and cross sections of Pit 211. Upper left, east-west section after excavation, upper right, north-south section before excavation.

The party which worked at the site in June was determined to find additional structures at this site. The mound-like configuration of the surface and the scattered surface cultural material suggested that other structures might be found to the southwest of House I. Accordingly, a trench was run west of the southwest corner of the house for 25 feet without finding any indications of structures and a series of 8 small trenches were run off of each wall of the house without results. Then an area 114 feet east-west and 84 feet north-south was laid off to the southwest of the site and divided into six-foot squares (fig. 13). A test pit was sunk 1 foot into the hardpan in each numbered square and many of them were connected by trenches, but no evidence of houses, walls or floors was produced. Surface material, which ranged from 15 inches to 26 inches in depth and which varied in color from light to dark brown with a certain amount of admixture of whitish chalky material, covered the sandy subsoil hardpan. Following this operation a number of pits and trenches were sunk at varying distances and in all directions from House I (fig. 13), and four of these pits were sunk to a depth of eight feet into the hardpan from the present surface. The conclusion was reached, of course, that House I stood solitary and alone. A pit, however, was found in square 211.

Pit 211 (fig. 15) was a bell-shaped excavation, 7 feet 9 inches below the upper surface of the subsoil, filled with culture-bearing material. The height of the bell-shaped pocket itself was 4 feet 4½ inches. A definite line of cleavage existed between the culture-bearing fill of the deposit and the sandy subsoil which formed its sides. The walls themselves were very easily defined beyond any doubt, as the brown fill of soft material fell away from the hard sandy clay at the slightest touch of the trowel and left the true surface of the wall exposed. When one considers the regularity and definiteness with which its walls were outlined in the hard yellow clay, it cannot be doubted that this pit was the result of deliberate design. A depression or niche was present in the western wall.

The floor was covered with charcoal 1½ inches thick and was very well made and remarkably level. Two small stones were imbedded near its center and slightly to the southeast. Below the floor of the pocket lay a stratum of white sandy sterile material to an undetermined depth. Eight inches above the floor near the eastern wall, the broken remains of a pot were discovered and a second broken pot was found near the northwest wall on the floor level.

Messrs. Kilgate and Crandall, geologists of the International Smelting and Refining Company, examined this site at our request and agreed that the yellow sandy clay in which the pit was dug represents deep water deposition, probably of the early level of Lake Bonneville and that Pit 211 was artificially dug into this deposit. They also stated after a non-microscopic examination of the fill that it seemed to be identical with the fill obtained from below the base of the walls of House I. This leads to the conclusion that House I and Pit 211 were contemporaneous, a view supported by a typological study of the collections presented in a later section.

Bonneville Bench

Old residents had reported discovery of skeletons on the Bonneville Bench at the site of the present smelter when the latter was erected. A careful survey of the Bonneville Bench for five miles each way from the smelter was made without finding other indications than a few scattered arrow points and some crude gray Shoshone potsherds.

Settlement Canyon

This site was located on the left side of the canyon, on the flood bench, about one mile from the mouth, three miles southwest of the town of Tooele, across the creek from the road. The indications consisted of a few pieces of adobe, bearing willow impressions, plain gray sherds and some unworked flint chips. A survey indicated that this may possibly be a pit house site, though more probably a Shoshone outdoor kitchen site.

HOUSE TYPES OF THE NORTHERN PERIPHERY IN UTAH

IN Table 2 are set forth for comparative purposes the principal characteristics of all types of structures of the Northern Periphery in Utah which have been excavated to date and which have been published with sufficient description or illustration to make them clear. It is believed that this tabulation represents the present known distribution of house types in Utah north of the Colorado plateau.

It will be seen at once that the majority of the structures excavated and reported upon in this paper conform in general to an archaeological architectural "complex," represented also at Kanosh, Beaver, Paragonah, Round Valley, Juab County, Provo and Willard. To this series of sites we have by the present investigations added Marysvale, Ephraim, and Tooele, proving that this particular "complex" or mode of living was also used in the central valley of Utah. A few of the outstanding traits of the complex are: all structures are located in the open, the majority at a low elevation; none are located in the cliffs or mountains; the dwelling houses are free standing, with vertical adobe walls, and roof entrances. They lack inside firepits. The houses are rectangular in plan, usually consisting of one room, although small unit houses of two and three rooms occur. These structures are found in groups ranging from two or three to a possible twenty, associated with what are thought to be ceremonial rooms, or kivas, of various types. It is probable that several such small communities occupied a given region or neighborhood contemporaneously and together formed regional communities, although this cannot be determined with accuracy due to the destruction of many sites. The kivas, when they occur, may be round and on the surface (Beaver and Paragonah), although evidence of this type is very scanty and unsatisfactory. The distinctive type of kiva is the quadrangular type, semi-subterranean in structure, with an interior clay-rimmed firepit, a possible sipapu, wood beam superstructure, interior post support and ventilator (sometimes of timbered tunnel construction) which more often than not enters from one of the corners (southeast, southwest, northeast), rather than from the south. Some kivas have two small entrances of this sort, assumed to be ventilators, and the only deflectors found, except for a questionable instance at Beaver, are of the angled corner type made of clay. These kivas lack the bench, the pilasters, the circular plan, the subterranean or side entrances connecting with houses and the free standing deflectors of the kivas of the San Juan and other southern areas. The dwelling houses and other structures are usually grouped around the kivas in an irregular semi-circular fashion, although there is no definite or regular mode of orientation. So far as we know now this architectural complex represents the greatest advance made by the Pueblo peoples in Central and Western Utah, north of the Colorado plateau. In the Uintah Basin, Green River drainage and Fremont regions, the most "advanced" houses were rectangular masonry structures in the open, and masonry structures of irregular plan in caves and on cliffs, although in all these regions other, perhaps older, types of structures without free-standing walls have also been found.

Turning again to Central and Western Utah, we note that the adobe construction complex just mentioned represents the latest known phase of Pueblo occupation. Preceding this development (as shown by superpositions at Willard[1] and possibly in our superposition of House IIa on IIb at Ephraim 1) was a phase of which the principal architectural feature was a modified shallow pit house. In central and western Utah these structures appear at Beaver, Paragonah, Grantsville, Nephi, Provo and Willard as well as at Ephraim. The general characteristics of this earlier complex may be summarized as follows: the dwelling structures are quadrangular, usually square, in plan; the excavation of the pit is comparatively shallow (6 to 12 inches below the original surface); the sides of the pit are covered with plastered or tamped adobe, rather than slabs; the walls are sloping and the superstructure of beams covered with willows and adobe assumed the form presumably of a truncated pyramid or of a truncated cone, although at Ephraim there is evidence of vertical walls; four

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[1] Steward, 1933a, p. 7.

TABLE 2. TRAIT LIST OF UTAH SITES

	Kanosh (1)	Kanosh (2)	Kanosh (3)	Beaver (4)	Beaver (5)	Beaver (6)	Beaver (7)	Paragonah (8)	Paragonah (9)	Paragonah (10)	Round V. (11)	Nephi (12)	Juab (13)	Provo (14)	Grantsville (15)	Willard (16)	Willard (17)	Marysvale 3, I & II	Marysvale 7	Marysvale 7–pits	Marysvale 712-3	Ephraim 1 III & VI	Ephraim 1, IIa	Ephraim 1, IIb	Ephraim 3 & 1, I	Tooele I	Uintah (18)	Uintah (19)	Uintah (20)	Moab (21)	Boulder (22)	Pleasant Creek (23)	Torrey (24)	Torrey (25)	Fish Creek (26)	Nine mile (27)	Nine mile (28)	Nine mile (29)	Nine mile (30)	Nine mile (31)	Piedra A (32)	Piedra B (33)	Piedra C (34)
1. Location																																											
a. Cave																																x		x	x					x			
b. Open	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				x		x			x	x	x	x	x	x	x	x
1) Low	x			x		x	x	x	x	x	x	x	x	x	x	x	x	x								x										x	x						
2) High																			x	x	x	x	x	x	x						x		x					x			x	x	x
3) Slope																											x	x											x				
2. Type Dwelling																																											
a. Above surface	x			x	x	x		x			x		x	x		x		x	x			x	x			x		x			x	x		x				x	x	x			x
b. Semi-subt.							?		?	?		x			x		x			x	x			x	x		x						x		x	x	x				x	x	
1) Shallow							x		x	x		x			x		x			x	x			x			x						x		x	x	x				x	x	
2) Deep																				x	x																						
3. Walls	x	x	x	x	x	x	?	x	?	x	x	x	x	x	x	x	x	x	x	?		x	x		x	x	x	x				x									x		
a. Materials																																											
1) Adobe	x			x	x	x		x			x		x	x		x		x	x			x	x			x							x					x					
2) Jacal							x		x	x		x			x		x			?	x		?	x	x		?				x	x	x								x	x	
3) Slab																									x									x		x							
4) Masonry																												x			x		x	x			x		x	x			x
b. Type																																											
1) Vertical	x			x	x			x		x	x		x	x		x		x	x		x	x	x			x		x			?	x	x	x	x		?		x	x		x	x
2) Sloping							x		x			x			x		x		?					x	x		x									x		x			x		
4. House plan																																											
a. Quadrangular	x			x	x	x	x	x	x	x	x	?	x	x	x	x		x	x		x	x	x	x	x	x	x	x			?	x	x							x	x	x	x
1) Square							x		x						x						x		x	x		x		x															
2) Rectangular	x			x	x			x			x		x	x		x		x	x			x			x		x				?	x	x										
3) Irregular						x						x																												x	x	x	x
b. Curved																	?			x														x	x								
1) Circular																	?																	x		x		x	x				
2) Oval																																			x		x						
3) Irregular																				x																							
5. Firepit	x			x	x	x	x			x		x			x		x	x		x	x		x	x		x	x	x							x	x		x			x	x	
a. Interior						x	x		x	x		x			x		x	x			x		x	x			x	x							x	x		x			x	x	
b. Exterior	x			x	x			x																																	x	x	
c. Rim						x	x			x					x		x	x			x			x		x	x	x								x		x					
1) Clay, adobe						x	x			x					x		x	x			x						x	x							x	x		x					
2) Stone																																										x	
3) None							x	x	x			x											x																			x	
d. Int. surface																																											
1) Stone paving																										x									x			x			x	x	
2) Adobe clay															x		x	x			x		x	x												x					x	x	
3) None																																											
6. Floor house																																											
a. Stone																						x													x								
b. Adobe	x			x		x	x		x			x			x		x	x	x	x	x	x	x		x			x								x	x	x	x	x	x	x	x
c. Cobblestone				x																		x		x																			
d. Post holes, int.						x	x		x			x			x		x						x	x	x	x	x	x				x	x		x	x		x			x		
1) Corners							x		x			x			x		x						x	x												x		x			x		
2) Median Line																										x																	
3) Irregular						x						x											x		x		x	x							x								
e. Bins divisions	x					x						x																							x								
7. Entrance													x																														
a. Roof	x						x	x	x	x		x		?	x		x	x	x	x	x	x			?	x	?	?						x		x	x	x	x		?	?	x
b. Side								x	x														x									x			?					x	x	x	
8. Rooms																																											
a. Single				x		x	x	x	x	x				x	x	x		x	x	x	x	x	x		x	x	x	x				x	?	x	x	x	x	x	x	x	x	x	
b. Double	x			x				x					x						x			x																					x
c. Three or more	x												x																		x												
1) Curve																																											
2) Linear	x												x																														
3) U-plan																																											
4) L-plan																															x											x	x
9. Kiva	x	x	x		x			x						x	?				x																								
a. Surface	x				?			?																																			
b. Semi-subt.		x	x											x	x				x																						x	x	
c. Round					x										?																										x	x	
d. Quadrangular	x	x	x											x					x																								
e. Firepit		x	x		x			x											x																						x	x	
1) Rim		x	x					x											x																							x	
2) Surfaced																			x																							x	
f. Deflector		x			x														x																								
1) Stone floor																																											
2) Clay corner		x	x																x																								
3) Wattle					?																																					x	
g. Ventilator		x	x		?									x					x																							x	
1) S. W.																			x																								
2) S. E.			x		E.?			E.?											x																							x	
3) N. W.																																											
4) N. E.		x												x																													
h. Post holes		x	x		x																																				x	x	
i. Sipapu		x	?																x																								
j. Bench		?																																							x	x	

interior upright posts support the superstructure; the entrance was by a roof hole, covered with a discoidal slab of stone; a circular clay rimmed and clay lined fire pit occupied the center of the floor. The rooms were in all cases single and the houses were grouped in communities of half a dozen or so. It is doubtful if anything which might be called a specialized ceremonial room, or kiva, existed in this complex. In Eastern Utah this stage is represented typologically by circular open-site pit houses with slab lined pits in Nine Mile Canyon.[2]

We shall refer to the pit house complex in Central and Western Utah as Type A and the adobe complex as Type B. Since Type A represents an advance over the typical Basket-Maker III pit houses of the southern areas, one problem remaining to be solved is the derivation of the type. The next consideration is the Type B complex in which the work of the present expedition was centered. On several grounds it seems improbable that the Type B complex, particularly the vertical adobe walls, independently evolved directly out of the Type A pit houses which emerged above the ground, especially since in Type B we have an entirely new principle of wall construction and a new principle of roof support. Furthermore, the kivas of Type B, while showing some features derived possibly from the Type A pit houses (squarish plan, interior roof support, interior clay-rimmed fire pits), nevertheless show certain traits which were either radical inventions on the spot or importations from the south, probably the latter (ventilators, deflectors, sipapus and increased depth of the semi-subterranean portion). In view of these facts it seems probable that the Type B complex represents an influx of architectural traits brought in from outside the area.

In this connection, mention should be made of a few structures previously described in this report. House I, Marysvale 3, with its interior fire pit and vertical adobe walls standing on the surface, may be considered typologically as a transition form between Type A and Type B. Interior fire pits in free standing, adobe-walled houses, however, were also found by us at Ephraim (House IIa) and Tooele, and by Judd at Beaver. The small rectangular semi-subterranean slab-lined pit house, represented by House I at Ephraim 1, is another transition form which, however, does not stem directly from the Type A forms. The only other occurrence of this type in Utah, aside from our examples near Ephraim, of which the writer is aware is in Zion Park.[3]

Pit structure 3-12 at Marysvale 7 is an interesting structure typologically and it conforms most closely to Roberts'[4] jacal B from southwestern Colorado among known possible prototypes. It shows many characteristics in common

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[2] Gillin, 1938a, p. 7.

[3] Wetherill, 1934.

[4] Roberts, 1930, pp. 36–50.

REFERENCES FOR TABLE 2

Kanosh (1) Steward, 1933a, pp. 17–30.
Kanosh (2) Steward, 1933a, p. 26. Mound 6, Kiva A.
Kanosh (3) Steward, 1933a, p. 29. Mound 6, Kiva B.
Beaver (4), Judd, 1925, p. 21 ff. George Mound.
Beaver (5) Judd, 1925, p. 26 ff. Bradshaw Mound, first level.
Beaver (6) Judd, 1925, p. 26 ff. Bradshaw Mound, first level, Room 15.
Beaver (7) Judd, 1925, p. 26 ff. Bradshaw Mound, lower levels, "Willard type."
Paragonah (8) Judd, 1926, 54 ff., 69 ff. Surface houses.
Paragonah (9) Judd, 1926, pp. 54 ff., 69 ff. "Willard" shelters.
Paragonah (10) Judd, 1926, Wattle houses.
Round Valley (11) Smith, 1935, 12.
Nephi (12) Gillin, unpublished notes.
Juab (13) Montgomery, 1894, 299 ff.
Provo (14) Steward, 1933a, 15 ff.
Grantsville (15) Steward, 1933a, p. 9 ff.
Willard (16) Steward, 1933a, p. 7 ff. Superimposed on Willard type (see below).
Willard (17) Judd, 1926, p. 4 ff.
Uintah (18) Steward, 1933a, p. 32. Pit house type. See also Reagan, 1932.
Uintah (19) Steward, 1933a, p. 33. Rock Wall type.
Uintah (20) Reagan, 1932, p. 162 ff.
Moab (21) Cummings, 1910.
Boulder (22) Morss, 1931, 3.
Pleasant Creek (23) Morss, 1931, p. 4.
Torrey (24) Morss, 1931, p. 14, Site 12.
Torrey (25) Morss, 1931, p. 15, "Moki houses."
Fish Creek (26) Morss, 1931, p. 17 ff. Site 11, cist 1.
Nine Mile Canyon (27) Gillin, 1938a. Valley floor slab houses.
Nine Mile Canyon (28) Gillin 1938a. Boulder masonry of valley floor.
Nine Mile Canyon (29) Gillin, 1938a. Pinnacle houses.
Nine Mile Canyon (30) Montgomery, 1894. Moki Houses.
Nine Mile Canyon (31) Montgomery, 1894, dry masonry Type.
Piedra A (32) Roberts, 1930, 22 pp. –36.
Piedra B (33) Roberts, 1930, pp. 36–50.
Piedra C (34) Roberts, 1930, pp. 50–59.

with the Type A pit houses of Utah, with the principal differences of greater depth of excavation and small upright posts along the edge of the floor, which form the base of the jacal wall. The principal difference between pit structure 3-12 and Roberts' jacal B is that the main interior support posts of the former are located some distance from the corners of the walls, rather than forming part of the walls themselves, a feature which suggests jacal A. Whether it conforms exactly to jacal A or B, and the writer inclines to believe that it represents a variation, the interesting thing is the possible typological connection with the Utah Type A pit house of both pit structure 3-12 and the so-called jacal houses of southwestern Colorado. If such a derivation is possible in Utah it is also possible in Colorado, and it seems that if we are looking for outside centers of development for the Type A complex, the upper San Juan might present the developmental sequence we need. House IIb at Ephraim 1 represents a similar "transition" type with its shallow plastered pit, evidence of vertical wattle-and-daub walls and interior fireplace.

ARTIFACTS

Projectile Points. Mr. John Henry of Marysvale had in his possession a collection of over 100 projectile points which he had picked up during his life in the vicinity of the Marysvale 3 site. The author measured and classified these points simply for comparative purposes, eliminating those which did not fall into the following five classes, all of which are found in our collection.

1. Triangular, plain base, no notches (Pls. IIb, 9, 16; III, 7; IV, 4; Va, 4; Vb, 1; VIIa, 5, 6; VIIb, 5, 16; VIII, 8)
2. Side notched (Pls. III, 2, 10, 13; IV, 5, 24, 25; Vb, 3, 5; VIIa, 7; VIIb, 3, 15, 20)
3. Tanged, flaring wings, base notches (Pls. IIb, 5, 10, 17, 21; III, 1; IV, 6, 7, 26; Vb, 8, 9; VIa, 2; VIb, 2; VIIb, 1, 2, 22)
4. Tanged, no notches (Pls. IIb, 6, 20; IV, 8; VIIb, 17)
5. Leaf shaped (Pls. IIb, 18; Va, 3; VIIb, 18; VIII, 9, 22)

The tabulation of the average measurements on the above types in Mr. Henry's collection is shown in Table 3 (measurements in millimeters).

TABLE 3. AVERAGE MEASUREMENTS OF PROJECTILE POINTS IN THE HENRY COLLECTION

Type	No.	Length	Range	Breadth	Range	Thickness	Range
1	18	25.5	16–34	17.0	14–20	3.9	3–5
2	10	25.2	23–29.5	12.1	10.5–15	3.3	2–4.5
3	12	21.6	22–36	16.0	13.5–19	3.9	3.5–5
4	22	23.9	16–30	12.5	10–19.6	3.9	3–6
5	4	30.5	24–42	12.5	11–14	4.2	3.5–5

Such a classification is arbitrary, however, since it was possible only after eliminating variants, which were due possibly to imperfect or incomplete workmanship, and broken specimens, whose type could not be definitely determined. Many of the variants require special classes to themselves. At first the writer attempted to classify all collected points into the above five types, which certainly are the only discernible types clearly applicable for classification, but this attempt has been abandoned because of the impossibility of usefully typing the variants. Unless complete classification were possible, a count is meaningless. Therefore the points are presented pictorially to be appreciated by inspection.

The five types, however, can be reduced to three discernible "trends": first, a trend toward the simple unnotched, untanged point, generally triangular in shape (Type 1) of which the leaf-shaped Type 5 is apparently a variant; second, a side notched, untanged trend, with various treatments of the base, concave, convex, slightly notched, etc., (Type 2); third, a trend toward a point with end tang (Types 3 and 4). These trends probably represent adjustments to complementary methods of affixing the point to the projectile shaft; each represents a different application of physical principles for this purpose. These three trends in point making do not exhaust all the possibilities of adapting points to shafts, but they do seem to exhaust all the possibilities known to the inhabitants occupying these sites. Therefore, since the obvious purpose of points in this culture was primarily utilitarian, further variations in form may be regarded as embellishment, non-functional play with technique, or the results of imperfect or incomplete workmanship. All of these trends are represented at Marysvale 3 and 7, Ephraim 1 and Tooele 1, and the writer fails to find any significant omissions as among the forms.

Knives. Larger blades which probably were used as knives occurred at all sites (Pls. IIb, 14, 15, 23; III, 9, 16; IV, 9, 10, 21; VIb, 3, 5; VIIa, 2; VIIb, 7, 8; VIII, 1, 3, 5, 7, 23) and in all cases they were retouched on both surfaces. In some cases they were so narrow as to appear to have been used as "spear" points (Pls. III, 12; IV, 3; Vb, 4, 6, 7; VIIb, 9; VIII, 4, 24).

Scrapers. Occasional scrapers, which are rather formless or tend toward discoidal shape and were retouched on one side only, occur but rarely (Pls. III, 3; VIIb, 6, 21).

Other Minor Artifacts. The occurrence of other minor artifacts, with the exception of pottery, is summarized as follows:

STONE BALLS

Marysvale 3, level 2 (Pl. IIb, 7)

Marysvale 7, pit structure 3-12
Marysvale 7, pit structure 1–13 (Pl. III, 8)
Marysvale 7, Kiva A, level 2 (Pl. IV, 17)
Marysvale 7, pit structure 2-12
Ephraim 1, between House II and VI
Ephraim 1, House IIa (Pl. VIII, 19)

Stone Slabs With Red and Yellow Parallel Lines

Ephraim 1, House IIa (Pl. VIII, 20)
Ephraim 1, House IIb (Pl. VIII, 25)
Ephraim 1, between House II and VI (Pl. VIII, 28)

Perforated Clay Disks ("Spindle Whorls")

Ephraim 1, House III (Pl. VIII, 6)
Tooele, House I, level 1 (Pl. VIIb, 10, 11)

Unperforated Clay Disks ("Game Counters")

Marysvale 3, House I (Pl. IIb, 11)
Marysvale 3, level 3 (Pl. IIb, 4)
Marysvale 7, Kiva C (Pl. Vb, 2)
Tooele, House I, level 1
Tooele, Pit 211, level 3 (Pl. VIIb, 38)
Tooele, Pit 211, level 4 (Pl. VIIb, 36)
Tooele, Pit 211, level 8 (Pl. VIIb, 37)

Clay Elbow Pipes

Marysvale 7, Kiva A, level 1 (Pl. IV, 20)
Marysvale 7, Kiva C
Marysvale 7, House II (Pl. VIIa, 4)

Clay Straight Pipes

Marysvale 7, Kiva A, level 1 (Pl. IV, 1, 23)

Stone Elbow Pipes

Marysvale 7, Kiva A, level 1

Bone Straight Pipes

Marysvale 3, House I (Pl. IIb, 19)
Marysvale 7, Kiva C (Pl. Vb, 13)

Figurine-like Objects of Clay

Marysvale 3, House II (Pl. IIb, 22)
Marysvale 7, Kiva A, southwest ventilator (Pl. IV, 63)
Ephraim 1, House IIa (Pl. VIII, 21)

Rectangular Bone Game Counters

Marysvale 3, House I (Pl. IIb, 12)
Marysvale 7, Kiva C (Pl. Vb, 16)

Rectangular Bone Game Counters With Perforation

Marysvale 3, level 4 (Pl. IIb, 2)

Bone Pendants, Perforated and Unperforated

Marysvale 7, Kiva A, level 1 (Pl. IV, 19)
Ephraim 1, House IIa (Pl. VIII, 15–17)

Bone Awls

Marysvale 3, level 2 (Pl. IIb, 1, 3)
Marysvale 3, House 1 (Pl. IIb, 8)
Marysvale 7, pit structure 2–12 (Pl. III, 4, 5)
Marysvale 7, pit structure 2–17 (Pl. III, 11, 14)
Marysvale 7, pit structure 3–12 (Pl. III, 15)
Marysvale 7, Kiva A (Pl. IV, 12–16, 27, 28)
Marysvale 7, Kiva B (Pl. Va, 2)
Marysvale 7, Kiva C (Pl. Vb, 12, 14)
Marysvale 7, pit structure 1–14 (Pl. VIa, 1)
Marysvale 7, House I, Room 1 (Pl. VIb, 4)
Marysvale 7, House III (Pl. VIIa, 1)
Tooele 1, pit 211 (Pl. VIIb, 23)
Ephraim 1, House I (Pl. VIII, 2)
Ephraim 1, House IIa (Pl. VIII, 12, 13, 14)
Ephraim 1, House III (Pl. VIII, 10, 11)
Ephraim 1, between Houses IIa and VI (Pl. VIII, 27)

Bone Whistle

Marysvale 7, Kiva B (Pl. Va, 1)
Marysvale 7, Kiva C (Pl. Vb, 15)

Antler Tips

Marysvale 3, House I (Pl. IIb, 13)
Marysvale 7, pit structure 2–12 (Pl. III, 6)

Shell Beads (*Olivella biplacata*)[1]

Marysvale 7, Kiva A, level 1 (Pl. IV, 18)
Marysvale 7, Kiva C (Pl. Vb, 10, 11)
Tooele, House I, level 2 (Pl. VIIb, 12, 13)

Manos and Metates. These assumed several forms. The manos can be classified as: rectangular in cross section, square in cross section, keeled bottom with rounded or square backs, or any of these shapes with "rocker" bottom, i.e., a flat bottom with the ends turned up. Metates may be spoken of as the flat type with little or no depression, scoop-shovel types with deep depression and rim effect around three edges and finally the Utah type, with deep grinding surface and platform at one end with secondary depression. Examples of each of these types were found at Marysvale 3, Marysvale 7, Ephraim 1 and Tooele 1. Direct association with specific rooms is of doubtful importance because of the possibility that the implements were thrown out of rooms previous to abandonment. In fact many specimens were found on or near the surface outside of the structures. Irregularly shaped rubbing stones were found at all sites. However, the specimens which were found inside the structures are listed in Table 4, below.

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[1] Identified by Dr. W. J. Clench of Harvard University.

Table 4. TYPES OF MANOS AND METATES

Site and Structure	Metates	Manos
Marysvale 3, House I	Utah (2 spec.) Flat	Rectangular rocker Rectangular
Marysvale 7, Pit structure 3–12	Flat Utah Scoop shovel	Rectangular (2 spec.) Square rocker Square
Marysvale 7, Kiva A	Flat	Square (4 spec.)
Marysvale 7, Kiva C	Scoop shovel	Rectangular rocker
Marysvale 7, House I, Room 1	Scoop shovel Utah Flat (2 spec.)	Rectangular
Marysvale 7, House I, Room 2	Utah	Keeled Square Rectangular
Ephraim 1, House VI, Room 2	Utah Flat	None
Ephraim 1, House III	Scoop shovel	Keeled Square (2 spec.) Square, rocker (2 spec.)
Ephraim 1, House IIa	Scoop shovel Flat	Rectangular Rectangular, rocker Square
Tooele 1, House I	Utah Flat (2 spec.) Scoop shovel	All types

POTTERY

THE sites discussed in this report have one feature in common with many other open sites investigated in Utah in recent years, namely, a notable paucity of whole pottery pieces. While sherds were abundant in most of the sites, the reconstruction of their shapes was in most cases impossible. Only one whole vessel was recovered during the season and five restorable vessels (Pl. IX).

A word should be said as to our pottery classification. The correlation of the pottery of the Northern Periphery with stages or phases of culture to the South has not yet been evolved although its relation to and probable derivation from the wares of the San Juan region seem superficially obvious. Nor has there been worked out or accepted for the Northern Periphery any definitive typology and nomenclature. Furthermore, it is only natural that local variations in pottery making peculiar to the area should have grown up here.

In view of these difficulties and also because of the fact that the present writer is not an expert on Southwestern ceramics, we have resorted to a descriptive classification which aims to avoid the premature fixing of names to these wares. It is hoped that those who have a greater knowledge of Southwestern pottery will find in this a usefully complete and consistent presentation of the chief features of the different wares.

This formula method of notation, at first glimpse, may seem repelling, but a few minutes patience on the part of the reader will show that the descriptions are serviceable even if they do not become an accepted method of ceramic analysis.

This method is described in more detail elsewhere,[1] but it is essentially a form of shorthand whereby the characteristics of sherds may be set down briefly and compared objectively. The formula P-gr3-tm3-wh-tx3-fr4; in-gr3-sm; ex-gr3-sm (rf) means, literally transcribed: Paste-medium gray-medium sized temper-white-medium texture-poor firing; interior surface-medium gray-smoothed; exterior surface-medium gray-smoothed (sometimes covered with fugitive red). The above formula may be readily compared with another, for instance, P-gr1-tm3-bl-tx3-fr4; in-gr2-sm; ex-gr1-st. Paste-very dark gray-medium sized temper-black-medium texture-poor firing; interior surface-dark gray-smoothed; exterior surface-very dark gray-striated.[2]

In the field after the pottery and artifacts had been cleaned they were examined in camp. The artifacts were measured and described; these data were entered on cards, kept in a card index file. The sherds were examined and reduced to formulae, which were also entered on cards. The collection was then wrapped in its sack for shipment. Rechecking by having the observer again describe sherds by formula which he had described weeks before served to show some variation in observation, but in no case was such variation sufficient to cause serious error. Subsequent checking in the Archaeological Laboratory of the Ohio State Museum has shown the writer that this method, if somewhat laborious, provides for him at least the most accurate and easily handled way of comparing a collection such as the present. Considerable variation in detail (after discounting the observer's variation) is to be found among the sherds, e.g., one sherd will be discolored by earth seepage or smoke, but is readily identified with sherds which have not been discolored. One sherd will represent a piece from the unpainted portion of a vessel, but belongs nevertheless with other sherds which agree in all other important respects except that they are painted; etc. These minutiae are discoverable by the use of the formula method with a considerable saving in labor, if, as was the case with these collections, it is necessary to keep a large number of small collections separated. In short, what is attempted here is a realistic, if somewhat meticulous, exposition of exactly what was found in the way of sherds. On the other hand it should be noted that "meticulous" does not mean exhaustive. Lacking equipment and experience we have not attempted an analysis of paint, a microscopic or chemical analysis of paste or a systematic analysis of color. Standards of judgment were established with the aid of Hawley's manual and an examination of the material in the University of Utah Museum of Anthropology. For instance, if the manual calls a ware "dark gray," specimens of this ware in the Museum were examined and their color used by us as "dark gray." It would be excellent if some energetic research man would devote himself at some time to a thorough study of Utah pottery in all its significant aspects because of its potential use as a diagnostic trait in the imperfectly explored Northern Periphery, but such a study is beyond the scope of the present paper.

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[1] Gillin, 1938b.

[2] The definition of the terms is essentially the same as that which is used in the glossary of Hawley, 1936, p. 10.

Two points, however, may be emphasized at this time: first, the relationship between the designs of the painted wares and those of the Kayenta and Mesa Verde districts of the San Juan; second, the extraordinary development of corrugated decoration at Marysvale 7. The absence of corrugated decoration from all sites except Marysvale is in line with Steward's findings of a cleavage between north and south in the western part of the state, where corrugation is absent in the north. All told it emphasizes the relative importance of relief decoration to the student of prehistory in Central and Western Utah.

The following list consists of an alphabetical notation of pottery symbols.

ap	applied decoration
ao	all-over
bi	bright
bk	brick
bl	black
bn	burnished, or polished shiny surface
br	brown
bt	blunt
bu	buff
ci	circles or curvilinear lines
cm	cream
co^1	corrugations or coils, very large (less than 1 per centimeter)
co^2	corrugations or coils, large (1–2 per centimeter)
co^3	corrugations or coils, medium (2–4 per centimeter)
co^4	corrugations or coils, small (4–6 per centimeter)
co^5	corrugations or coils, very small (7 or more per centimeter)
cr	crosses
dh	deep or high
di	diagonal
dm	diamonds
do	dots (in painted work), nobbins or buttons (in raised relief), round depressions (in depressed relief)
du	dull
fc	firing clouds
fi	finger nail
fl	floated surface
fr	firing (characteristic of paste)
gl	glaze
gr	gray
ho	horizontal
id	indented
is	incised
le	lip everted
li	lip inverted
ln	line or lines
ls	lip straight or direct
mi	mica
mn	mineral temper
na	naturalistic decoration
nk	neck only (referring to decoration)
or	orange
ov	oval
P	paste
pa	painted
pe	perforated or punched
pi	pinched
pl	plain surface
po	pointed (referring to instrument)
pu	purple
py	polychrome
rb	rim bevelled
rd	red
re	relief
rf	fugitive red
ro	rounded (referring to corrugations)
rr	rim rounded
rs	rim square
sa	shallow
se	series
sh	sherd temper
sl	slip
sm	smoothed
sn	singly
sp	spirals
sq	squares
st	striations
th	thumb markings, or finger markings
tm	temper
tr	triangles, or angles
tx	texture, of paste
uf	unfinished surface

ve	vertical
W1	very thick wall (more than 8 mm.)
W2	thick wall (6–8 mm.)
W3	medium wall (4–6 mm.)
W4	thin wall (2–4 mm.)
W5	very thin wall (less than 2 mm.)
wa	wavy
wh	white
ye	yellow
1	*very* dark (color), large, wide, thick, coarse (size), or good
2	dark, large, wide, thick, coarse (size), good
3	medium (referring to any quality)
4	light (color), small, thin, fine (size), or poor
5	*very* light (color), small, thin, fine (size), or poor
/	this symbol, when occurring between two others means that both conditions described occur, with the condition described by the first symbol being more prominent.

Texture was judged on the scale of coarseness-fineness. Thus the symbol "tx2" signifies coarse texture; "tx1," very coarse texture; "tx4," fine texture; and so on.

The pottery types have been classified by site according to paste and surface characteristics. In regard to paste, the prime characteristic in classification here has been the color and size of the temper. Admittedly this classification is far from complete. The types are presented by formula and number; the bestowal of picturesque and allegedly generic names has been omitted.

The classification of pottery types in Table 5 is not regarded as a rigid or definitive treatment of the ceramic material from our sites or area. It is merely an attempt to set forth as concisely as possible, within the framework of the criteria indicated, the groups into which the sherds seem to fall and the sites at which specimens of the various groups occur. As more material accumulates and as it becomes possible, in consequence, to establish certain "wares" more definitely, the present "types" may perhaps be assimilated to such "wares" with more assurance. Several considerations have militated against setting up "wares" at the present time. 1) Practically all of the material recovered was in the form of sherds or incomplete fragments of vessels. While it is possible to distinguish several types of paste on the basis of temper and texture with a fair degree of assurance, there is no way of knowing the original combinations of surface treatment or of shape until one has a more representative collection of whole vessels for examination or a much larger series of sherds than we have at present. For example, many of our Type I-A (plain gray) sherds may be simply undecorated portions of black-on-gray vessels, whose painted portions we have placed in Type II-A. It is clear from our specimens that gray paste with fine black temper was used to make plain gray vessels, black-on-gray vessels, and also vessels with various forms of relief decoration. This is also true of various other types of gray paste, as Table 5 shows. But, from the data at hand, we do not know all the combinations of surface treatment nor the complete lists of shapes. 2) While temper and texture of paste are quite easily identifiable, the significance of color of paste and surface is less definite. Gray paste is most common in our sherd series. But it will be noted that we also have variations, with parallel temper and texture characteristics in some cases running through buff, yellow, orange, red, brown, and black. It is an open question whether or not these shades of paste and surface (on unslipped specimens) may not be overfired or otherwise unintentionally discolored varieties of gray, at least in some cases. In this connection, it will be noted that painted decoration occurs on unslipped gray and unslipped buff, but not on unslipped yellow, orange, red, brown or black. These are points the significance of which can perhaps be determined by future investigators with more material at their disposal. It is our hope that the classification of sherds presented in Table 5 will prove of assistance in such future studies.

The data at hand, however, do show some points of significance which can be more fully discussed at present. These matters are considered in the section entitled "Local Variations in Pottery" which follows Table 5.

TABLE 5. CLASSIFICATION OF POTTERY TYPES AND THEIR PROVENIENCE

I. PLAIN WARE

(See Pl. IX for restored vessels)

A. Gray paste, fine black temper, plain gray surfaces
 Formula: P-gr4-tm4-bl-tx3-fr3; in-gr3-fl; ex-gr3-fl; W3
 Sites:
  Marysvale 3, surface (some specimens with polish over float; shows some mica temper)
  Marysvale 3, House I

Marysvale 7, Pit 1, extension
Pit structure 2–12; also with mica temper
Pit structure 3–12; also with mica temper
Pit structure 3–13
Pit structure 1–14
Pit structure 2–17
Kiva A; some show fugitive red on exterior surface; some, black paste and surfaces due to conflagration; a few sherds show a slightly yellowish interior surface, and some a medium reddish interior surface, possibly due to fugitive red traces; firing ranges from good to poor.
Kiva B
Kiva C
House I, Room 1; some with medium sized temper
House I, Room 2; interior rough, not floated
House II; round rim and everted lip
House III; also some with smoke-blackened surfaces
House IV; also with good firing
House V; also with medium red interior surface
Ephraim, surface
between Houses II and VI
House VI, Room 1
House VI, Room 2
House VI, Room 1 below floor
House VI, Room 2 below floor; also mica temper
House I; also medium temper
House IIa
House IIb
House III; also mica temper
Tooele, House I, level 3; also striated interior
Pit 211, levels 1, 2, 3, 4, 5, 6, 9 (Pl. VIIb, 49)

B. Gray paste, coarse black temper, plain gray surfaces
Formula: P-gr3-tm2-bl-tx4-fr3; in-gr3-sm; ex-gr3-fl; W2
Sites:
Marysvale 3, surface
House I
House II
Marysvale 7, Pit 1, extension; round and square rims; also floated interior
Pit structure 2–12; sometimes with paste overfired dark red
Pit structure 3–13; also with mixture of mica in the temper
Pit structure 1–13; also with black paste
Pit structure 3–13; also, overfired dark red paste
Pit structure 1–14
Pit structure 2–17
Kiva A; also with very dark paste and floated interior; also with dark brown paste; temper sometimes shows on surface
Kiva B; also with black paste
Kiva C
House I, Room 1; also mica temper mixed in; striated interior
House I, Room 2; also with rough unsmoothed interior
House II; also with very poor firing and granular temper protruding on exterior surface
House III; also with very large temper and square rim; neck pieces of wide-mouth olla and cylindrical-necked jar from this site
House IV; also with paste fired black; striated exterior; paste sometimes overfired to brown or red
House V; poorly fired and friable
Ephraim, surface; surfaces are striated and smoothed between Houses II and VI.
House IIa; some sherds show black and white coarse temper
House VI, Room 1
House VI, Room 2, below floor
Tooele, House I, level 1
Pit 211, level 9; also with mixed black and white temper

C. Gray paste, fine white temper, plain gray surfaces
Formula: P-gr2-tm4-wh-tx4-fr4; in-gr3-sm-rf; ex-gr2-bn; W3
Sites:
Marysvale 3; also with floated exterior
Marysvale 7, Pit structure 3–12
Pit structure 3–13; sometimes with fugitive red
Pit structure 1–14; round rim and everted lip
Kiva A
Ephraim, surface
House VI, Room 2
Tooele, House I, levels 1, 2, 3; round rims and everted lips; also with medium sized temper (Pl. VIIb, 31)

D. Gray paste, coarse white temper, plain gray surfaces
Formula: P-gr2-tm1-wh-tx2-fr4; in-gr2-fl; ex-gr2-fl; W2-rs
Sites: Marysvale 7, House I, Room 1
Tooele 1, House 1, Pit 211 (Pl. IXf).

E. Yellow paste, fine black temper, plain yellow surfaces
Formula: P-ye4-tm4-bl-tx3-fr3; in-ye4-rf; ex-ye4-rf; W2.
Sites:
Marysvale 7, Kiva A; also burnished; also lighted yellow and finer temper; also good firing
Pit structure 3–13
Ephraim, House IIa; well fired; striated interior; grayish exterior surface
House IIb; same as above.
Variation: orange; coarse black temper
Formula: P-or4-tm1-bl-tx2-fr5; in-or5-fl; ex-or5-fl; W1-rr-ls
Sites:
Ephraim, House VI, Room 2
House IIb

F. Buff paste, fine black temper, buff surfaces
Formula: P-bu3-tm3-bl-tx4-fr3; in-bu4-fl; ex-bu1-fl; W3
Sites:
Marysvale 3, House I and II
Marysvale 7, House I, Room 2; also with smoothed surface
House II
Pit structures 2–12, 2–17, 3–12
Kiva A; also dark buff interior; also burnished surfaces
Ephraim, between House II and VI; also with mixed black and white temper

Houses I, IIa, III, VI, Room 2 below the floor

G. Buff paste, coarse black temper, plain buff surfaces
Formula: P-bu3-tm2-bl-tx2-fr4; in-bu3-sm; ex-bu3-sm; W2
Sites:
Marysvale 7, House I, Room 2
Pit 1 extension; also with large, uneven bluish temper
Pit structure 2–12
Kiva B
Ephraim, surface
House IIa

H. Buff paste, fine white temper, plain buff surfaces
Formula: P-bu3-tm4-wh-tx3-fr2; in-bu3-sm; ex-bu3-sm; W4
Sites:
Marysvale 7, House V
Tooele, House I, levels 1–3; also burnished interior; also horizontal strips of fugitive red on exterior (Pl. VIIb, 32.)
Pit 211, levels 1, 2, 3, 6, 8, 9; level 9 specimens have fugitive red and burnished exteriors

I. Red paste, fine black temper, plain red surfaces
Formula: P-rd2-tm4-bl-tx2-fr4; in-rd4-st; ex-gr2-sm; W3
(Possibly overfired gray ware of Type IA)
Sites:
Marysvale 7, Pit structure 1–14; temper is mica here
Ephraim, House VI, Room 2
Tooele, Pit 211, level 5; light buff paste, medium black temper, red interior and buff exterior surfaces

J. Red paste, coarse black temper
Formula: P-rd2-tm1-bl-tx1-fr5; in-rd1-sm; ex-gr1-fl
(Possibly overfired gray ware of Type IB)
Marysvale 7, Kiva A

K. Red paste, fine white temper, plain red surface
Formula: P-rd5-tm4-wh-tx3-fr2; in-rd4-sm; ex-rd4-sm; W3-rr-ls.
Sites:
Marysvale 7, Pit 1, extension; 1 piece with medium brown paste core, paste fading red toward surfaces, small black temper, fine texture, good firing; surfaces same as above
Kiva C

L. Red paste, coarse white temper, plain red surfaces
Formula: variable
Sites:
Tooele, surface; pinkish, coarse paste, coarse white temper; very light red or pink surfaces, striated
Pit 211, level 6; coarse white temper, terra cotta pink paste fired black toward surfaces, dark reddish surfaces
Pit 211, level 9; definite external red slip; also very large white pebble temper, reddish paste, surfaces smoke blackened and polished

M. Brown paste, fine black temper, plain brown surfaces
Formula: P-br3-tm4-bl/mi-tx4-fr3; in-br2-sm; ex-br2-fl; W3
Sites:
Marysvale 7, Pit structute 2–12 and 3–12
House III; smoke-blackened surfaces, red banded lip (Pl. VIIa, 20)
Ephraim, House IIa
Tooele, House I, level 1; level 2, interior red slip (Pl. VIIb, 31).

N. Brown paste, coarse black temper, plain brown surfaces
Formula: P-br2-tm2-bl-tx2-fr4; in-br3-sm/st; ex-br2-sm/st; W2
Sites:
Marysvale 7, Kiva B; also with smoked blackened surfaces, Kiva C
Ephraim, House IIb, House VI, Rooms 2 below the floor

O. Brown paste, coarse white temper, plain brown surfaces
Formula: P-br3-tm1-wh-tx2-fr4; in-br4-sm(tm); ex-br2-sm; W1
Sites:
Tooele, House I, level 1, level 2; rounded rims here
Pit 211, level 7

P. Black paste, fine black temper, red interior, gray exterior
Formula: P-bl-tm1-bl-tx2-fr3; in-rd4-sm; ex-gr3-sm; W4
Sites:
Marysvale 7, House 3 (Pl. VIIa, 22)

II. PAINTED WARE

BLACK-ON-GRAY

A. Unslipped, painted; gray paste, fine black temper
Formula: P-gr3-tm4-bl-tx4-fr2; in-gr3-fl-pa-bl-bn; ex-gr3-sm-rf; W3
Sites:
Marysvale 3, surface and squares 6 and 7; exterior floated and burnished; on some pieces paint has been overfired to dark red (Pl. IXb). (Pl. IIb, 25 [striated in use], 26, 27)
House I and II; polish or burnish over paint (Pl. IIb, 31 [dished rim], 33, 37, 38, 39)
Marysvale 7, House I, Room 1; also with medium sized temper; also with surface crackled (Pl. VIb, 10, 12, 14)
Surface (Pl. III, 17)
Pit structure 2–12; with square rim (Pl. III, 27, 29)
Pit structure 3–12 (Pl. III, 52, 56)
Pit structure 1–13 and 2–17 (Pl. III, 36, 35, 37, 44)
Pit structure 1–14; also with mixed mica temper (Pl. VIa, 3)
Pit 1, extension; very small temper and very good firing; both round and square rims occur
Pit structure 2–17 (Pl. III, 44)
House I, Room 2; also with darker gray paste (Pl. VIb, 19, 25, 26, 27)
House II; also with thin walls, square rim and straight lip (Pl. VIIa, 10, 14, 9)
House III (Pl. VIIa, 21, 23)
House IV; also with striated exterior

House V; straight lip, wavy in profile (Pl. VIIa, 29, 30, 31, 32)
Kiva A; round rims (Pl. IV, 34, 35, 41, 52, 54, 57, 58)
Kiva B (Pl. IXe)
Kiva B and C: also with mica temper (Pl. Va, 8, 9) (Pl. Vb, 17, 20, 21, 25, 26, 33, 34, 35, 37)
Ephraim, surface; with round rims
House IIa; also with mixed black and white temper (Pl. VIII, 46, 51, 52)
House III (Pl. VIII, 39)
House VI, Room 2, under floor; and also with medium-sized temper (Pl. VIII, 36, 44)
Tooele, House I, levels 1–3 (Pl. VIIb, 25, 29 with mica)
House I, levels: paste light gray, temper medium (Pl. VIIb, 28)
Pit 211, levels 1 and 8 (Pl. VIIb, 44, 45)

B. Unslipped painted; gray paste, fine white temper
Formula: P-gr4-tm5-wh-tx2-fr2; in-gr4-fl-pa-bl; ex-sm-rf; W3
Sites:
Marysvale 7, House I (Pl. VIb, 9)
Pit Structure 3–13
House II (Pl. VIIa, 3)
Kiva C (Pl. Vb, 27)
Ephraim, House IIb; VI, Room 2 (Pl. VIII, 38) (Pl. IXd)

C. Unslipped painted; gray paste, coarse white temper (Black-on-gray)
Formula: P-gr2-tm2-wh-fr4; in-gr2-fl-pa-bl; ex-gr3-sm
Sites:
Marysvale 7, Kiva A; bowl with dished rim from southeast ventilator (Pl. IV, 46)

BLACK-ON-BUFF

D. Unslipped painted; buff paste, fine black temper
Formula: P-bu4-tm4-bl-tx3-fr3; in-bu3-fl-pa-bl; ex-bu3-sm-rf; W3–4,
Sites:
Marysvale 3, House I (Pl. IIb, 32)
Marysvale 7, Kiva A (Pl. IV, 42, 59, 61-painted both sides)
Pit 1, extension
Pit structure 2–12; also with mica temper (Pl. III, 25, 28)
Pit structure 3–12 (Pl. III, 49, 50)
Kiva B; also with reddish paste (Pl. Va, 11)
Kiva C; round rims (Pl. Vb, 27)
Ephraim, House IV
Tooele, House I, level 1, 2
Pit 211, level 7

E. Unslipped painted; buff paste, coarse black temper
Formula: P-bu4-tm2-bl-tx4-fr4; in-bu2-fl-pa-bl; ex-bu2-sm; W3-rr-ls.
Sites:
Marysvale 7, Kiva A; also with light gray paste combined with buff surfaces (Pl. IV, 48)
Pit structure 1–13 (Pl. III, 39-applied handle)
House I, Room 1 (Pl. VIb, 11)
Ephraim, House IIa

F. Unslipped painted; buff paste, fine white temper
Formula: P-bu5-tm4-wh-tx4-fr1; in-gr3-fl-pa-bl; ex-gr4-fl-rf; W3–4
Sites:
Marysvale 7, Kiva A (Pl. IV, 49)
Kiva A-1st level (Pl. IXe)
Kiva B; paste yellowish, with mica temper (Pl. Va, 7)
Ephraim, between Houses II and VI; House IIa

BLACK-ON-WHITE

G. Slipped, painted; gray paste, fine black temper
Formula: P-gr3-tm4-bl-tx4-fr3; in-sl-wh-pa-bl; ex-gr3-sm; W3-rr
Sites:
Marysvale 3, surface
Houses I (Pl. IIb, 30) and II
Marysvale 7,
Pit 1, extension
Pit structure 1–13; with straight lip (Pl. III, 33, 34)
Pit structure 1–14 (Pl. VIa, 6)
House I, Room 1; polish over paint
House I, Room 2 (Pl. VIb, 16–18)
House II (Pl. VIIa, 11)
Kiva A; also with mica temper; coarse texture; buff external surface and fugitive red; also polished interior and slipped, painted exterior (Pl. IV, 29, 30, 31)
Kiva C (Pl. Vb, 18, 19)
Ephraim, between Houses II and VI
House IIa; also with very dark gray paste (Pl. VIII, 43, 49)
House IIb (Pl. VIII, 48)
House IV (bowl with horizontal perforated handle) (Pl. VIII, 30)
Tooele, House I, level 1, 2; also with medium-sized temper (Pl. VIIb, 24, 30)
Pit 211, level 8

H. Slipped, painted; gray paste, coarse black temper
Formula: P-gr5-tm2-bl-tx4-fr2; in-sl-wh-pa-bl; ex-gr5-sm-rf; W2
Sites:
Marysvale 7, Pit structure 2–12 (Pl. III, 24, 26)
Ephraim, House VI, Room 2 (Pl. VIII, 37)
House IIa
Variation: Gray slip
Formula: P-gr5-tm2-bl-tx3-fr3; in-gr5-sl-pa-bl; ex-gr3-sm-rf; W2
Sites:
Marysvale 7,
Pit structure 2–12; burnish over paint
Pit structure 3–12; very hard firing (Pl. III, 54)
House I, Rooms 1 and 2; House II
Kivas A, B and C (Pl. Va, 5, 6, 12; Pl. Vb, 28)
House III

I. Slipped, painted; gray paste, fine white temper
Formula: P-gr4-tm4-wh-tx4-fr2; in-sl-wh-pa-bl; ex-sl-rd5; W4
(White interior slip and red exterior slip)
Sites:
Marysvale 3, surface (Pl. IIb, 32—exterior surface shown)
Ephraim, surface (without red exterior slip)

J. Slipped, painted; gray paste, coarse white temper
  - Formula: P-gr4-tm2-wh-tx2-fr3; in-sl-wh-pa-bl-bn; ex-sl-rd3; W3
    - (White interior slip and red exterior slip)
  - Sites:
    - Marysvale 7, Pit 1, extension
    - Ephraim, House IIa (without exterior red slip)

BLACK-ON-RED

K. Slipped, painted
  - Formula and sites: P-bu3-tm4-mi-tx3-fr3; in-rd2-sl; ex-rd2-sl-pa-bl; W4[5]
    - Marysvale 7, Kiva A (Pl. IV, 47)
    - P-cr4-tm5-wh-tx1-fr1; in-rd3-sl-pa-bl; ex-rd2-sl; W4
    - Marysvale 7, House IV
    - P-or3-tm3-bl-tx4-fr2; in-rd3-sl-pa-bl; ex-rd3-sl; W3-rr-ls
    - Marysvale 7, Kiva C (Pl. Vb, 38)
    - P-or3-tm4-bl-tx3-fr4; in-rd4-fl-pa-bl; ex-rd4-fl; W3
    - Ephraim, House IIa
    - P-rd5-tm4-wh-tx2-fr4; in-bu3-fl-pa; ex-gr1-sm; W3-rs-ls
    - Ephraim, House IIa

III. CORRUGATED AND PAINTED WARE

A. Painted interior, indented corrugated exterior
  - Formula: P-gr4-tm4-bl-tx4-fr2; in-gr3-pa-bl; ex-gr3-co3-id-po
  - Sites:
    - Marysvale 7, Kiva A
    - Pit structure 3–12
    - Marysvale 7, House I, Room 2: smoothed interior; characteristics same as Type II, A, except Black-on-gray painted decoration on exterior above shoulder, pinched corrugations below shoulder (Pl. VIb, 20)

IV. TYPES OF RELIEF DECORATION

(The following forms of relief decoration occur in plain gray and plain buff pottery with both small black temper and small white temper. To save space, paste formulae are not given here.)

A. Short, vertical, incised lines in series, "false corrugations"
  - Marysvale 7, Pit structure 1–14 (Pl. VIa, 8, 10)
    - Pit structure 2–17 (Pl. III, 42)
    - House I, Room 2 (Pl. VIb, 29, 30)
    - Kiva A, level 1
    - Kiva C (Pl. Vb, 22, 23)
  - Ephraim, House IIa (Pl. VIII, 47)
    - House III (Pl. VIII, 40)
    - Between Houses IIa and VI (Pl. VIII, 55)
    - House VI, Room 2
  - Tooele, House I, level 1 (Pl. VIIb, 26–27)
    - Pit 211, level 2 (Pl. VIIb, 35); "finger nail indentations" (Pl. VIIb, 41)

B. Short, vertical or slanting, incised lines in bands enclosed by horizontal incised lines
  - Marysvale 3, House I (Pl. IIb, 35)
  - Marysvale 7, House I, Room 2 (Pl. VIb, 22)
    - Kiva A, level 1 (Pl. IV, 50)
  - Ephraim, House VI, Room 2 (Pl. VIII, 42)

C. Short, punched lines in series
  - Marysvale 3, surface (Pl. IIb, 28, 29)
  - Marysvale 7, Pit 1
    - House V (Pl. IXa)
    - Kiva B (Pl. Va, 13, 15)
    - Kiva C (Pl. Vb, 31)
  - Tooele, Pit 211, level 2 (Pl. VIIb, 40)
    - level 4 (Pl. VIIb, 42)
  - Tooele, House I, level 1, Pit 211 (Pl. IX f)

D. Indented pellets
  - Tooele, House I, level 2 (Pl. VIIb, 33)

E. Pellets in series, horizontal
  - Marysvale 3, House II (Pl. IIb, 40)
  - Ephraim, I, House IIa, (Pl. VIII, 41)
  - House VI (Pl. VIII, 32)
  - Tooele, Pit 211 (Pl. VIIb, 39)

F. Indented applied band
  - Tooele, House I, level 2 (Pl. VIIb, 32)
  - Tooele, House I, level 1, Pit 211 (Pl. IX f)

G. Applied knobs in lines
  - Ephraim, House VI, Room 2 (Pl. VIII, 34)
  - Tooele, Pit 211, level 7 (Pl. VIIb, 43–51)
    - House IV (Pl. VIII, 30)

H. Pinched knobs
  - Marysvale 7, Pit 1
  - Tooele, Pit 211, level 4 (Pl. VIIb, 50)

I. Paired punches in horizontal bands
  - Ephraim I, between Houses IIa and VI (Pl. VIII, 54)

J. Punched dots
  - Marysvale 7, Kiva A, level 1 (Pl. IV, 32)
    - House I, Room 2 (Pl. VIb, 31)

K. Punched dots with horizontal incised lines
  - Marysvale 7, Kiva A, level 2 (Pl. IV, 51)

L. Plain horizontal incised lines
  - Marysvale 3, House I (Pl. IIb, 36)
  - Marysvale 7, Kiva C (Pl. Vb, 39)
    - Pit structure 2–17 (Pl. III, 40, 43)
  - Ephraim, House VI, Room 1 (Pl. VIII, 33)

M. Cross-hatched, incised
  - Marysvale 7, Pit 1
    - House I, Room 2 (Pl. VIb, 24)
    - Kiva C (Pl. Vb, 29)

N. Vertical incised lines on neck
  - Marysvale 7, Pit structure 1–14 (Pl. VIa, 8, 10)

O. Vertical, incised lines with vertical ridges perforated in parallel series
  - Marysvale 7, Pit structure 2–17 (Pl. III, 45)

P. Diagonal or spiral incised or scraped lines in parallel series
  - Marysvale 7, surface (Pl. III, 18)
    - Kiva B (Pl. Va, 17, 18)

Q. Plain corrugations, narrow
  - Marysvale 7, surface (Pl. III, 19)

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[5] Cf. Tusayan, Hawley, 1936, p. 29.

        - Pit structure 2–17 (Pl. III, 40, 43)
        - Pit structure 1–14 (Pl. VIa, 5)
        - Kiva A, level 1 (Pl. IV, 38, 44)
        - Kiva C (Pl. Vb, 40)

R. Plain corrugations, wide (interior of neck, plain gray ware)
    - Marysvale 7, Kiva A, level 2 (Pl. IV, 53)

S. Incised corrugations
    - Marysvale 7, Kiva C (Pl. Vb, 30)

T. Pinched or indented corrugations, coarse
    - Marysvale 3, House I (Pl. IIb, 34)
    - Marysvale 7, Surface (Pl. III, 23)
        - Pit structure 1–14 (Pl. VIa, 9)
        - Pit structure 3–12 (Pl. III, 53, 55, 57, 58)
        - Pit structure 2–17 (Pl. III, 48)
        - Kiva A, level 1 (Pl. IV, 33, 36, 37, 39)
            - level 2 (Pl. IV, 55, 56, 60, 62)
        - Kiva B (Pl. Va, 16)
        - Kiva C (Pl. Vb, 24, 41)
        - House I, Room 1 (Pl. VIb, 8)
        - House III (Pl. VIIa, 16, 17, 19)
        - House V (Pl. VIIa, 24, 27)

U. Pinched or indented corrugations, fine
    - Marysvale 7, surface (Pl. III, 20, 21, 22)
        - Pit structure 1–13 (Pl. III, 32, 38; Pl. VIa, 7)
        - Pit structure 1–14 (Pl. VIa, 7)
        - Pit structure 2–12 (Pl. III, 30, 31)
        - Pit structure 2–17 (Pl. III, 41, 46–48)
        - Pit structure 3–12 (Pl. III, 51, 53, 55, 57–59)
        - Kiva A, level 1 (Pl. IV, 40, 43)
            - level 2
        - Kiva B (Pl. Va, 14 [fugitive red exterior], 16, 19)
        - Kiva C (Pl. Vb, 32)
        - House I, Room 1 (Pl. VIb, 6–7)
            - Room 2 (Pl. VIb, 21, 23, 28, 32)
        - House II (VIIa, 12, 13)
        - House III (Pl. VIIa, 18)
        - House IV
        - House V (Pl. VIIa, 26, 28)

V. Pinched or indented corrugations with incised lines in design
    - Marysvale 7, Kiva A (Pl. IV, 45)
        - House V (Pl. VIIa, 25)

W. Pinched corrugations and Black-on-gray designs
    - Marysvale 7, House I, Room 2 (Pl. VIb, 20)

GENERAL REMARKS

Local Variations in Pottery

The reader who has followed the preceding description of culture found in Central Utah sites will have become aware of certain differences between the sites. These differences will now be examined in more detail. For the moment, we will consider only variations as between the culture at Marysvale 3, Marysvale 7, Ephraim 1 and Tooele 1.

Owing to the present lack of a reliable dendrochronological calendar for Utah, we have been unable to derive dates from the wood specimens collected at the sites in Central Utah.

Since pottery is an unusually sensitive trait in the Southwest, we may first look at the pottery variations represented here. The outstanding difference in pottery decoration seems to lie in the fact that corrugated pottery, both plain and pinched, is found only at Marysvale 3 and 7. A considerable quantity of fine corrugations with very fine pinched impressions (cf. IV, U, p. 41, for list of illustrations) occurs at Marysvale 7, and not at Marysvale 3. Because the development of a careful technique of fine corrugation is relatively late in Pueblo prehistory in areas where tree-ring dates are available, it would appear that Marysvale 7 was contemporaneous with, if not later than, the Pueblo III period. Unless the development of fine corrugation was further advanced here, than in the San Juan, which is improbable, the typological characteristics of the corrugated ware suggest that Marysvale 7 was occupied well into the 12th century, A.D. Furthermore, because the corrugation is so much finer than that found in Pueblo III sites in the San Juan, it is possible the Marysvale 7 may have been occupied considerably longer.[1] Plain neck corrugations occur here also, as well as "exuberant" pinched corrugations, characteristic classically of Pueblo II or Developmental Pueblo. The fact that only exuberant pinched corrugations occur at Marysvale 3 leads to the possibility that the site had been abandoned before the Pueblo III influence reached Marysvale 7. The latter is, therefore, on typological grounds, to be regarded as a later site. "False corrugations," i.e., short vertical incised lines in series to imitate corrugations, take the place of true pinched corrugation at Ephraim and Tooele. Other types of relief decoration show a less striking distribution, although the northern sites of Ephraim and Tooele seem to show a tendency toward applied relief decoration of various types.

Plain gray ware of gray paste with fine black temper (Type IA) occurs at each site, as do the other plain gray types, with the exception of plain gray with coarse white temper (Type ID) which occurs only at Marysvale 7. Plain yellow pottery (Type IE) occurs distinctively only at Marysvale 7, with an orange tendency at Ephraim. These yellow pieces may be over-fired or discolored plain gray. They differ from Jeddito yellow wares, according to Hawley[2] in having black, rather than whitish quartz temper. Buff plain wares are found at all sites, although black temper seems to be a specialty of the southern sites, Marysvale 3 and 7, also occurring at Ephraim, while the buff ware appears with fine white temper only at Tooele and in small quantity at Marysvale 7, House V. Red plain ware occurs at Marysvale 7, possibly representing an overfiring of plain gray types. A coarse pinkish ware with coarse white temper occurs at Tooele. All of these yellow and reddish wares suggest a possible connection with the Kayenta culture of the San Juan area. Plain brown wares occur at all sites, except Marysvale 3. The Tooele preference seems to incline to coarse white temper.

As regards the foreign derivations of the painted pottery, it seems to the present writer that those wares show relations both with the Kayenta and with the Mesa Verde districts of the San Juan—a statement which may be better judged by an examination of the plates. The frequent polish or burnish over the painted design, the tendency of the latter to fade into the background, the predominance of rounded rims and the feeling of the designs all point toward Kayenta. Specimens of Black-on-red slipped ware from Marysvale 7 seem to suggest Tusayan Black-on-red. Slipped Black-on-white occurs at all four sites. Black-on-buff may be peculiar to this area, although it does not occur at Marysvale 3.

Indications Of Non-Pueblo Influences

The bone harpoon point with two side barbs pictured in Pl. IIa deserves special mention. Its material is probably the leg bone of a deer. The point measures 104 millimeters long, 7 millimeters in its maximum diameter and 4 millimeters in its minimum diameter. The height of the barbs is 3 millimeters. Very light and thin parallel incisions or scratches, which run transversely to the main axis of the point, cover most of the surface. The point itself tapers to a smoothed, but somewhat blunt point. The butt end also tapers, but shows signs of "whittling" and is less well smoothed. No recognizable attachment for a line is present. This specimen was found at Ephraim 1, House VI, Room 1 just above the rather uncertain lower floor. So far as is known to this writer no specimen resembling this "harpoon point" has hitherto been reported from a pueblo site. Its position indicates that it predated the building of House VI, Room 1, but the presence of regular plain gray pottery in the same level indicates association with culture of the Pueblo type.

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[1] Roberts, 1937, p. 14; for Pueblo II corrugated types see Hargrave, 1931, p. 13 and Pl. III; also Guernsey, 1931, Pl. 66.

[2] Hawley, 1936, p. 75.

The hope of finding some definite connections between the historic nomadic Uto-Aztecan speaking Indians of Utah and the Pueblo inhabitants has long actuated investigators in this region. The following items of largely imperishable materials are found, according to Lowie,[3] among the Northern Shoshoneans:

Knives—Obsidian, irregular shape, sometimes with wood or horn handles
Arrowpoints—Thin, $\frac{3}{4}$ of an inch long, $\frac{1}{2}$ inch wide. Those used for hunting are wide
Axes—None
Antler Adzes—Sharpened for splitting wood
Steatite vessels
Stone mortars and pestles
Stone scrapers—Made from thin segments of quartzite, oval or circular with sharp edges, convex on one side and flat on the other
Bone awls
Bone salmon gigs
Sharpened ribs used as scrapers.
Drinking cups—Made from horn or bone of mountain sheep or buffalo
Spoons—Made from horn, bone or wood
Bows—Made from bone, mountain sheep and elk horn, moulded by wetting and heating
Shell Buttons and abalone shell beads—Obtained by trade from Coast Indians
Pottery bowls, cylindrical jars, water jars with stoppers—All of crude, gray or brown unpainted ware
Coiled and twined basketry
One-piece soft-soled moccasins
Round domed houses—Covered with sagebrush or grass (no evidence of former semi-subterranean dwellings)
Metates—The Paiute of Moapa use the metate on only one side. Such metates consist of a large flat rock and a small cylindrical stone is held in the hands. At the Ute reservation, Whiterocks, Utah, the metate is trough-like with two or three of the edges rimmed. Here the "smooth slab" metate is also used
Pipes—Made of stone among the Paviotso and Moapa. Those of the former people are straight
Side-notched projectile point—Added by Steward[4] as a Shoshonean trait, although it is not clear upon what authority. As this type is also characteristic of Basket-Maker sites, we cannot regard it as of great diagnostic value in the problem of Shoshonean influences

Of the above mentioned traits, the following have been found in our Central Utah cultures: Stone knives (although not obsidian); side-notched arrowpoints, stone scrapers, bone awls, pottery (although not of the Shoshonean types) and metate types. All in all, the traits which show resemblances are so general in character we can at present attach no precise significance to them.

CENTRAL UTAH AS AN AVENUE OF CULTURAL FLOW COMPARED WITH OTHER PORTIONS OF UTAH

Mention has already been made of the general similarity between the Central Utah sites and those of Western Utah in respect to architectural forms. Several cultural divergences between the two regions may, however, be noted on the basis of Steward's summation of Western Utah culture.[5] The term "Central Utah" is used to distinguish the area of the present investigations from those further west. Although Steward included the present area in his description of "Western Utah" at the time of his publication, practically no systematic excavations had been carried out in the Central Utah area. Our several specimens of Black-on-red pottery enlarge the scope of this type which previously was represented by a "small disk . . . from the vicinity of Utah Lake, the only specimen of this ware yet known from Western Utah." True Black-on-white ware, which is said to be lacking from Western Utah[6] has been established for Central Utah. Clay figurines are less numerous and less well made in the Central Utah sites. Wedges of antler are not found here as at Grantsville and Provo. Spatulate blades of bone, present at Willard and Grantsville, are absent here. Arrow straighteners are found only at Tooele. No stone bowls occur at the Central sites. Chisels, found in the Great Salt Lake region, are absent. Quartzite crystals occur much more frequently than in the western sites. Mortars and pestles are absent here. Textiles and skeletal material were not recovered in the Central sites, so that no comparison may be made.

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[3] Lowie, 1909, 1924.

[4] Steward, 1936, fig. 11.

[5] Steward, 1936.

Comparing the Central Utah sites with those of Eastern Utah summarized as the Fremont Culture by Morss,[7] we notice still greater divergences. We have already noted that the differences in architectural features are that Central Utah is characterized by open sites and the Fremont Culture by cave and cliff sites. The Fremont pottery is predominantly undecorated and although decorated forms do occur, they are less frequent and of a less developed type than the greatest advances made in Central Utah. Perhaps the knobbed pottery figured by Morss[8] is the type most different from any found at the Central sites. Figurines are much more frequent and elaborate in the Fremont Culture. Pipes are more frequent in Central sites and the Fremont lacks the elbow type. Metates of the "scoop-shovel" type seem to be absent in the Fremont and there is an absence of "rocker-bottom" manos. Side-notched arrowpoints are absent in the Fremont. Horn work of the Fremont type does not occur in the Central sites, nor do the Fremont "horned dancer" pictographs. Various items, such as moccasins, basketry and articles of clothing, occurring in the Fremont must be ruled out of comparison because of their possible lack of preservation in Central sites due to climatic differences. The same thing may be said of skin and various other more perishable "ceremonial" objects.

The round slab and masonry houses of Nine Mile Canyon[9] are absent in the Central region. The larger villages, more elaborate pottery and greater development of minor artifacts, all serve to show the greater advancement of the Central region over the Nine Mile region. The Uintah basin, although as yet imperfectly investigated[10] has so far produced only undecorated plain pottery and a relative paucity of artifacts, indicating the relative backwardness of its prehistoric inhabitants. The Nine Mile region appears closer to the general configuration of culture found in Central and Western Utah than do either the Fremont or the Uintah Basin. These three regions—Nine Mile and its general region, Central Utah and Western Utah—seem to be the portions of the Northern Periphery in Utah, thus far investigated, which show the strongest influence of the San Juan cultures.

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[6] Steward, 1936, pp. 20–60.

[7] Morss, 1931.

[8] Morss, 1931, Pl. 21, fourth row, second from left; Pl. 23, c; in our collection the specimen figured in Pl. VIII, 34 is the only piece suggestive of the Fremont knobbed pottery.

[9] Gillin, 1938a.

[10] Steward, 1933a; Reagan, 1931, 1932.

ANALYSIS OF THE ANIMAL BONES

By Glover M. Allen

THE bones recovered are chiefly of mammals, with a few of birds. By far the most abundantly represented are those of deer, but whether of Mule Deer or White-tailed Deer it is not possible to tell from the fragments. Probably, however, both are represented, for of two single large sections of antlers, one seems to be that of the former, and the other that of the latter. Mountain sheep bones are also present in some abundance, with occasional fragments of those of Pronghorn Antelope and a very few that are undoubtedly of Bison. All the bones are much broken, as if for marrow or for stewing, and include those of very young, perhaps even fetal, as well as adult animals. Next in importance as food mammals come Jack Rabbits and Cottontail Rabbits, the remains of which occur in a large proportion of the samples. Muskrat bones are also common and the animals may have supplied both food and fur. The same was probably the case with Beaver of which an occasional limb bone or part of skull was found. Bones of the Yellow-haired Porcupine occur in smaller proportions in all three localities, and doubtless indicate the occasional use of the species for food. Rock Squirrels' remains were found at Marysvale only and those of the Yellow-bellied Marmot at Ephraim only; both may have furnished food and fur.

The carnivorous species are very poorly represented. It is remarkable that in so large a series of bones there is not a single fragment of Domestic Dog, Wolf, Coyote or Fox. One maxilla of a Lynx was found among the bones from Marysvale and a few bones of Otter at Ephraim, while occasional remains of the Badger appear in the bones recovered at both Ephraim and Tooele. It is quite possible that the last, a burrowing species, is really an intrusive. Probably too, the frequent presence of gopher bones is due to natural causes since these animals tunnel everywhere in the soil. The single weasel jaw and the fragments of chipmunk, kangaroo rat and meadow mouse no doubt also represent animals that had died in the holes or burrows they occupied.

The metatarsal bones of deer and occasionally of Pronghorn Antelope seem to be those chiefly chosen for making implements, such as punches and "needles." The reason for this seems clear, for after much handling of these parts in both deer and mountain sheep, one comes to recognize even fragments of the former by their dense, fine-grained texture and delicate proportions, contrasted with the coarser-grained and less slender bones of the sheep. The bone of the deer takes on a fine polish, making it look almost like ivory. These qualities of deer bone, added to the straightness of the shaft, the strength and graceful outlines of the metapodials, impart to the deer and antelope bones a peculiar quality appealing to a trained hand and eye—a "feel"—to which the Indian artisan must have been sensitive. Furthermore, the metatarsals, and to a lesser extent the metacarpals of deer and antelope are marked by a median longitudinal groove on both fore and hind aspects, which are hardly developed in the corresponding bones of sheep, rendering them easier to cut or split into narrow lengths suitable for points. One cannot escape the notion, in looking through the material, that there must have been a considerable technique in the splitting of these bones for the purposes required.

Of birds, the identifiable fragments represent such food species as Sage Hen and Mallard Duck, what seems to be a species of goose and a small grebe. The Rough-legged Hawk and a smaller hawk may have supplied feathers. A wing bone of a White Pelican was found cut as if for some purpose. A list of the species is appended.

LIST OF SPECIES IDENTIFIED

Mammals

Weasel (*Mustela sp.*) Tooele
Badger (*Taxidea taxus subsp.*) Ephraim, Tooele
Otter (*Lutra canadensis interior*) Ephraim
Lynx (*Lynx uinta*) Marysvale
Cottontail Rabbit (*Sylvilagus sp.*, probably *S. nuttalli grangeri*) Marysvale, Ephraim, Tooele
Desert Jack Rabbit (*Lepus californicus deserticola*) Marysvale, Ephraim, Tooele
Chipmunk (*Eutamais sp.*) Tooele
Rock Squirrel (*Otospermophilus variegatus utah*) Marysvale

Yellow-bellied Marmot (*Marmota flaviventris ?engelhardti*) Ephraim

Beaver (*Castor canadensis frondator*) Marysvale, Ephraim

Pocket Gopher (*Thomomys uinta*) Marysvale, Ephraim, Tooele

Meadow Mouse (*Microtus sp.*) Tooele

Western Muskrat (*Fiber zibethicus osoyoosensis*) Marysvale, Ephraim, Tooele

Kangaroo Rat (*Dipodomys sp.*) Marysvale

Yellow-haired Porcupine (*Erethizon epixanthum*) Marysvale, Ephraim, Tooele

Deer (Probably both Mule Deer, *Odocoileus hemionus*, and White-tailed Deer, *Odocoileus virginianus macrourus*) Marysvale, Ephraim, Tooele

Pronghorn Antelope (*Antilocapra americana subsp.*) Marysvale, Ephraim, Tooele

Bison (*Bison bison*) Marysvale, Ephraim, Tooele

BIRDS

Small Grebe (?*Podilymbus podiceps*) Marysvale

White Pelican (*Pelecanus erythrorhynchos*) Tooele

Goose (*Branta*?) Marysvale

Mallard Duck (*Anas platyrhynchos*) Marysvale

Rough-legged Hawk (*Archibuteo*? *regalis*) Marysvale

Sage Hen (*Centrocercus urophasianus*) Marysvale, Ephraim, Tooele

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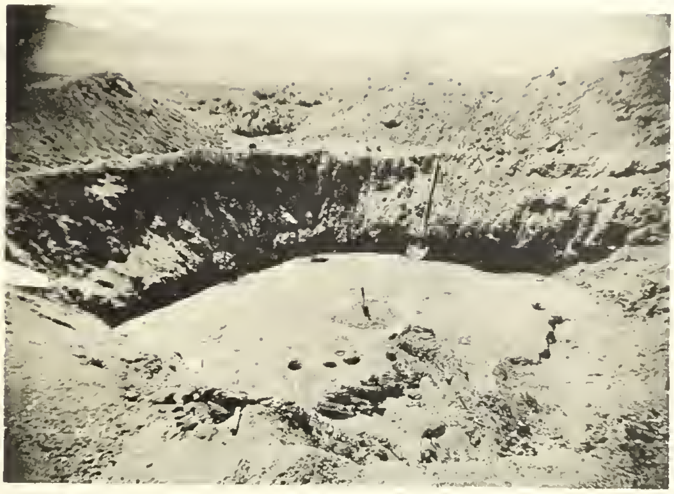
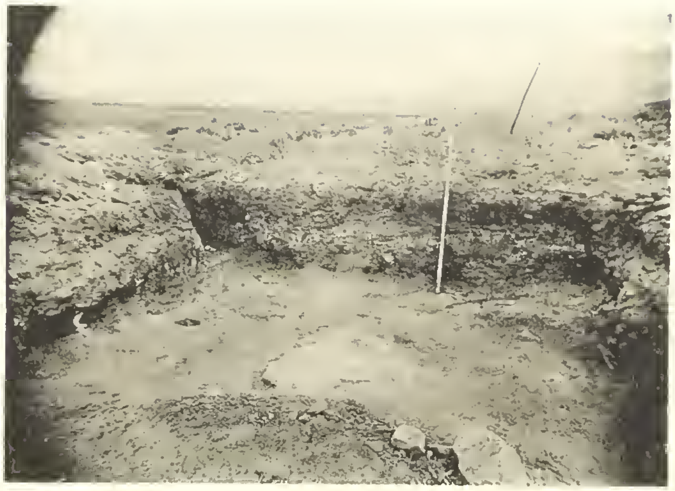
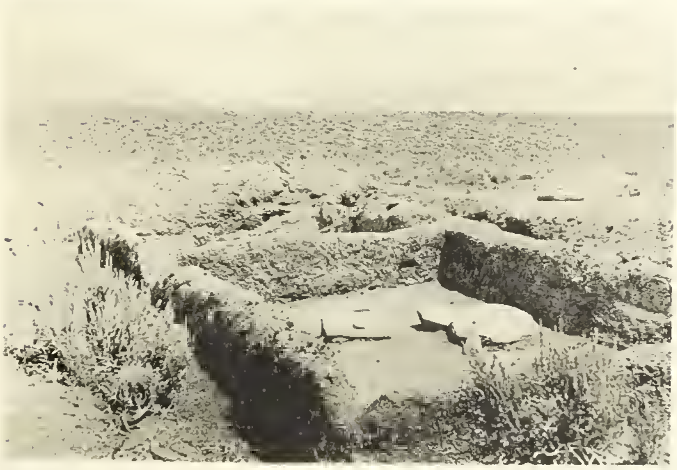
PLATES



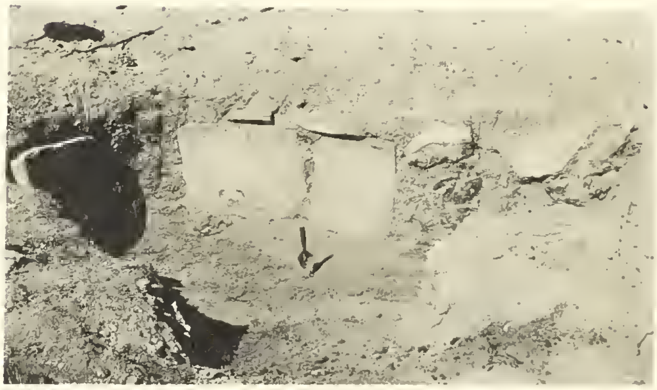
A. Marysvale 7, Pit structure 3–12 after excavation; view from the northwest.



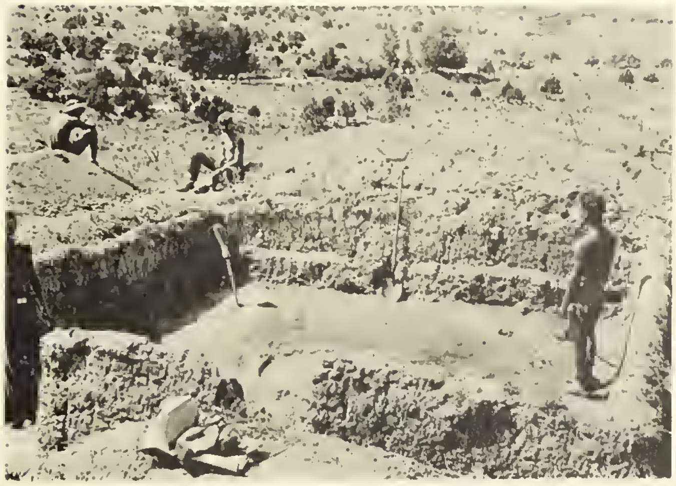
B. Marysvale 7, Kiva A after excavation; view from the east.



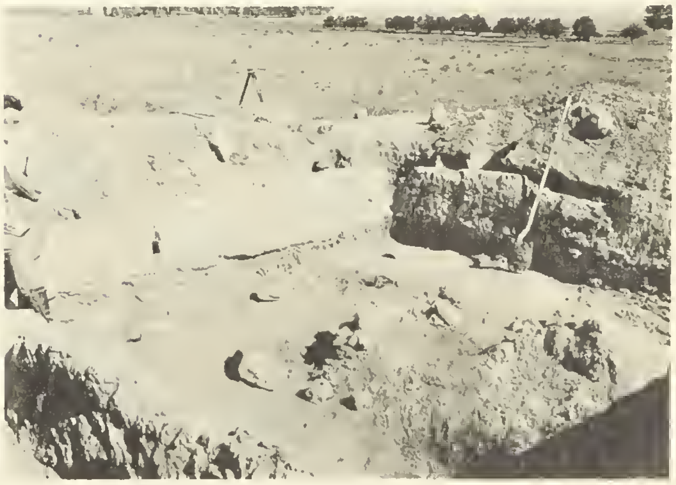
C. Marysvale 7, House I after excavation; Room 2 in the foreground.



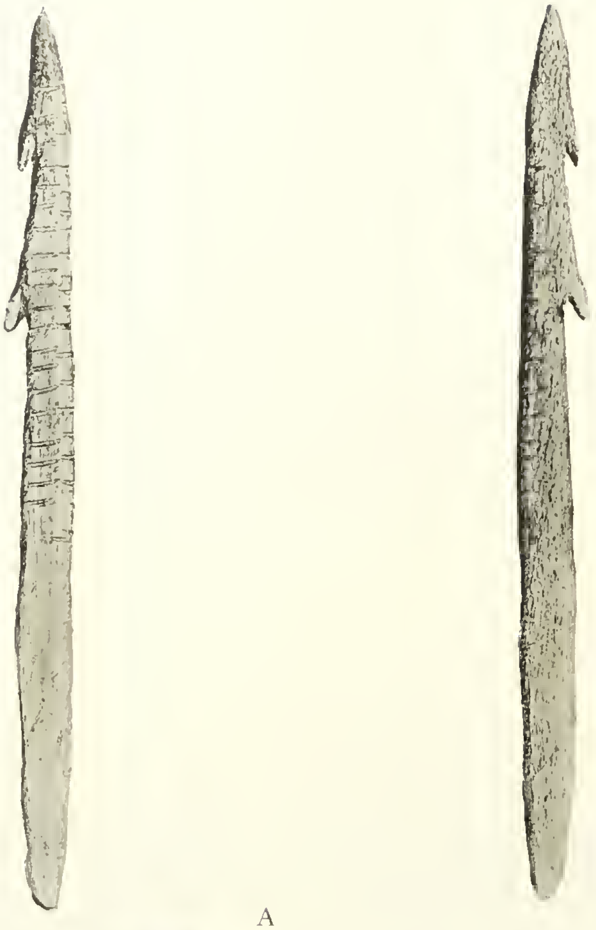
D. Ephraim 1, House I, showing slab walls. (Photograph by Elmer Smith during his partial excavations of 1935).



E. Ephraim 1, Houses IIa and IIb after excavation, showing floor and fire-pit of House IIb; door of House IIa at extreme left; view from the northwest.



F. Tooele 1, House I after excavation. Sight-seers have partially destroyed the walls. View from the southwest.



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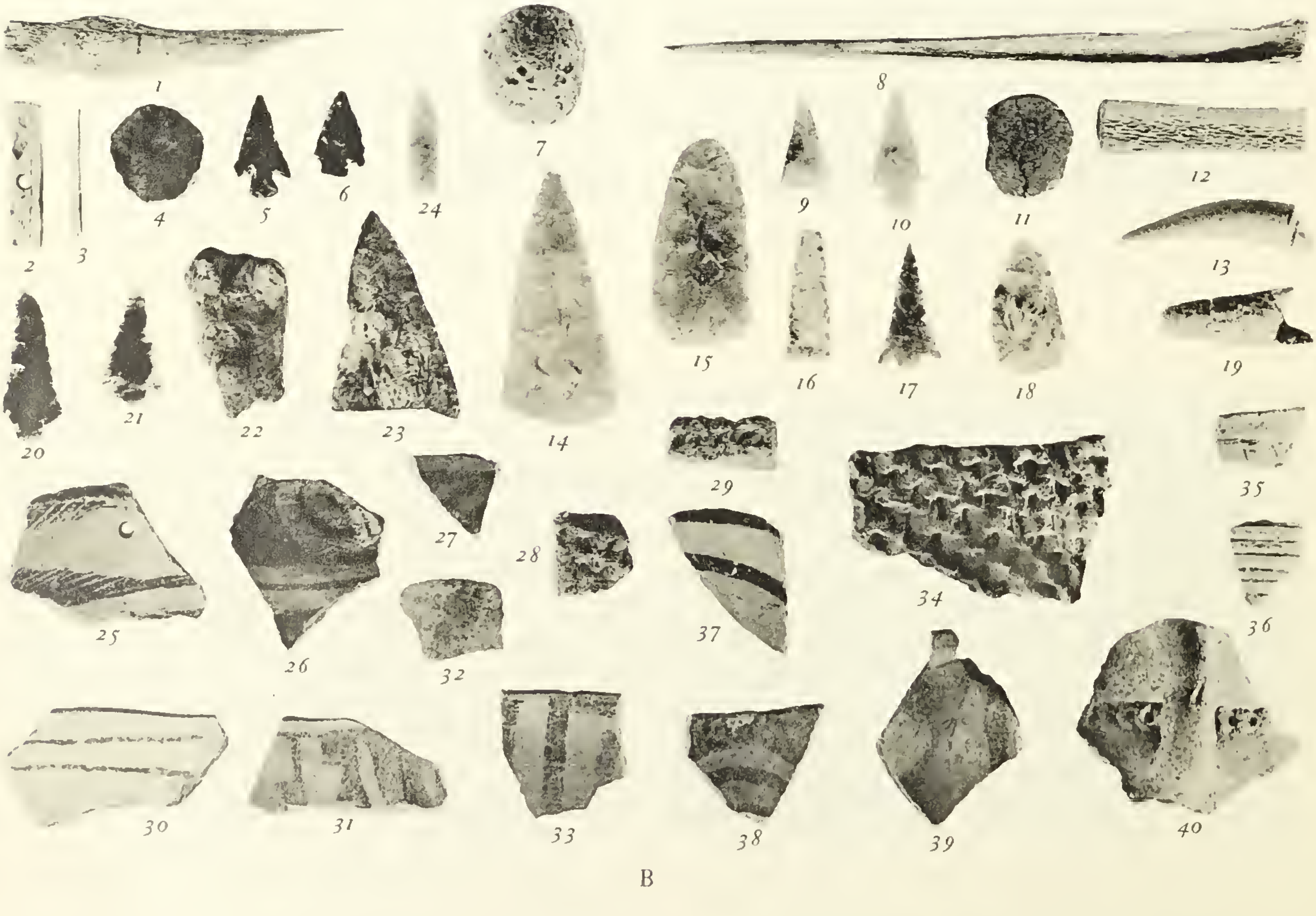
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PLATE II

a. Bone harpoon point from Ephraim 1, House VI. Actual size.

b. Marysvale 3. 1–7, 25–29, test in squares 6 and 7; 8–19, 30–36, House I; 20–24 and 37–40, House II.

Pottery

25–27, 31, 33, 37–39, Type II, A.
32, Type II, D.
30, Type II, G.
35, Type IV, B.
28, 29, Type IV, C.
40, Type IV, E.
36, Type IV, L.
34, Type IV, T.

Bone

19, bone straight pipe.
12, rectangular bone game counter.
2, rectangular bone game counter with perforation.
1, 3, 8, bone awls.
13, antler tip.

Stone

24, unclassified
9, 16, projectile points, Type 1.
5, 10, 17, 21, projectile points, Type 3.
6, 20, projectile points, Type 4.
18, projectile point, Type 5.
14, 15, 23, knives.
7, stone ball.

Miscellaneous

4, 11, unperforated clay disk.
22, figurine-like object of clay.

PLATE III

Marysvale 7. 1–3, 17–23, surface; 4–6, 24–31, pit structure 2–12; 7–8, 32–39, pit structure 1–13; 9–11, pit structure 3–13; 12–14, 40–48, pit structure 2–17; 15–16, 49–59, pit structure 3–12.

POTTERY

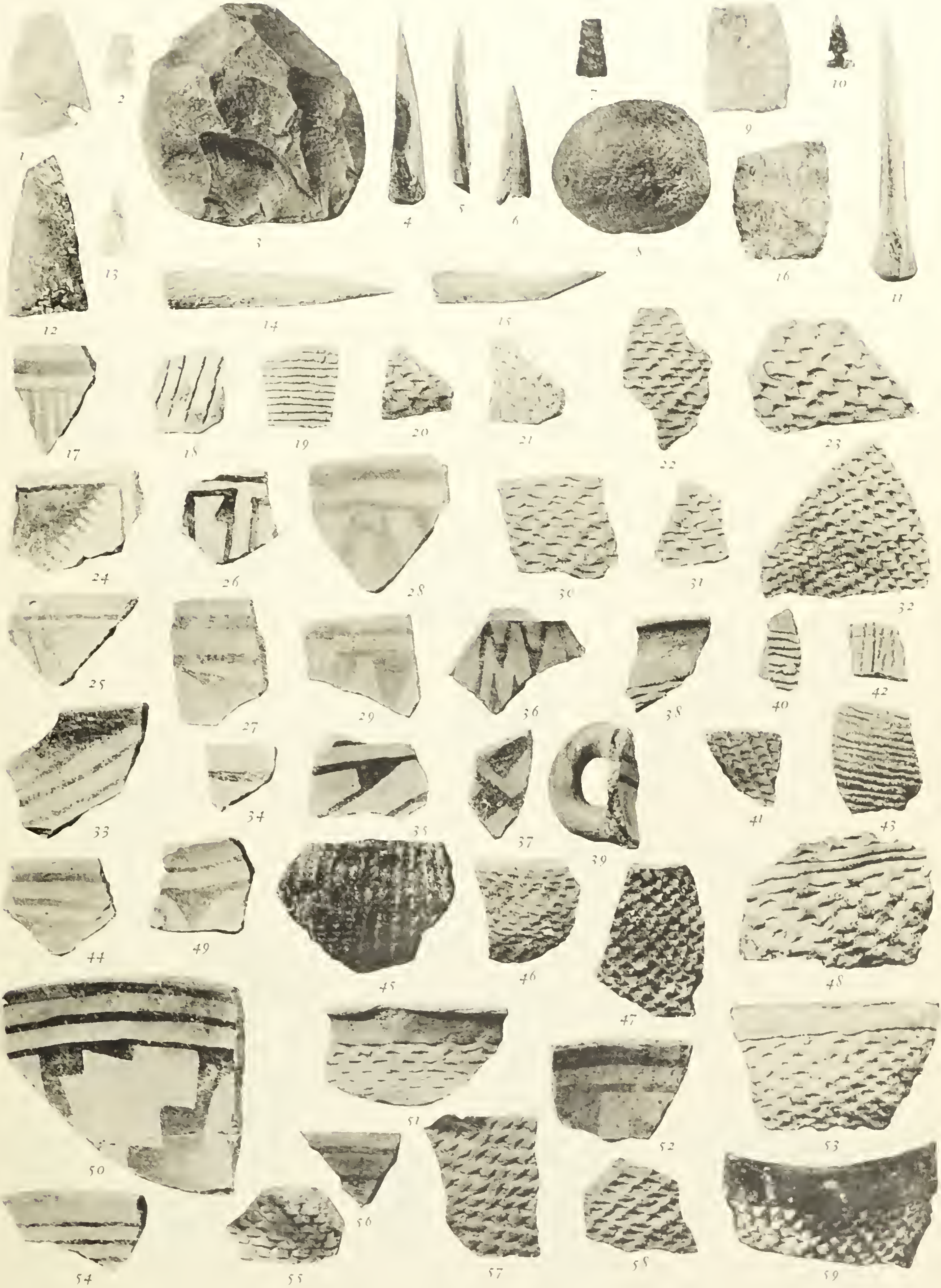
17, 27, 29, 35–37, 44, 52, 56, Type II, A.
25, 28, 49, 50, Type II, D.
39, Type II, E.
33, 34, Type II, G.
24, 26, 54, Type II, H.
42, Type IV, A.
40, 43, Type IV, L.
45, Type IV, O.
18, Type IV, P.
19, Type IV, Q.
20–22, 30–32, 38, 41, 46–48, 51, 53, 55, 57–59, Type IV, U.

BONE

4, 5, 11, 14, 15, bone awls.
6, antler tip.

STONE

7, projectile point, Type 1.
2, 10, 13, projectile point, Type 2.
1, projectile point, Type 3.
8, stone ball.
9, 16, stone knife.
3, scraper.
12, "spear" point.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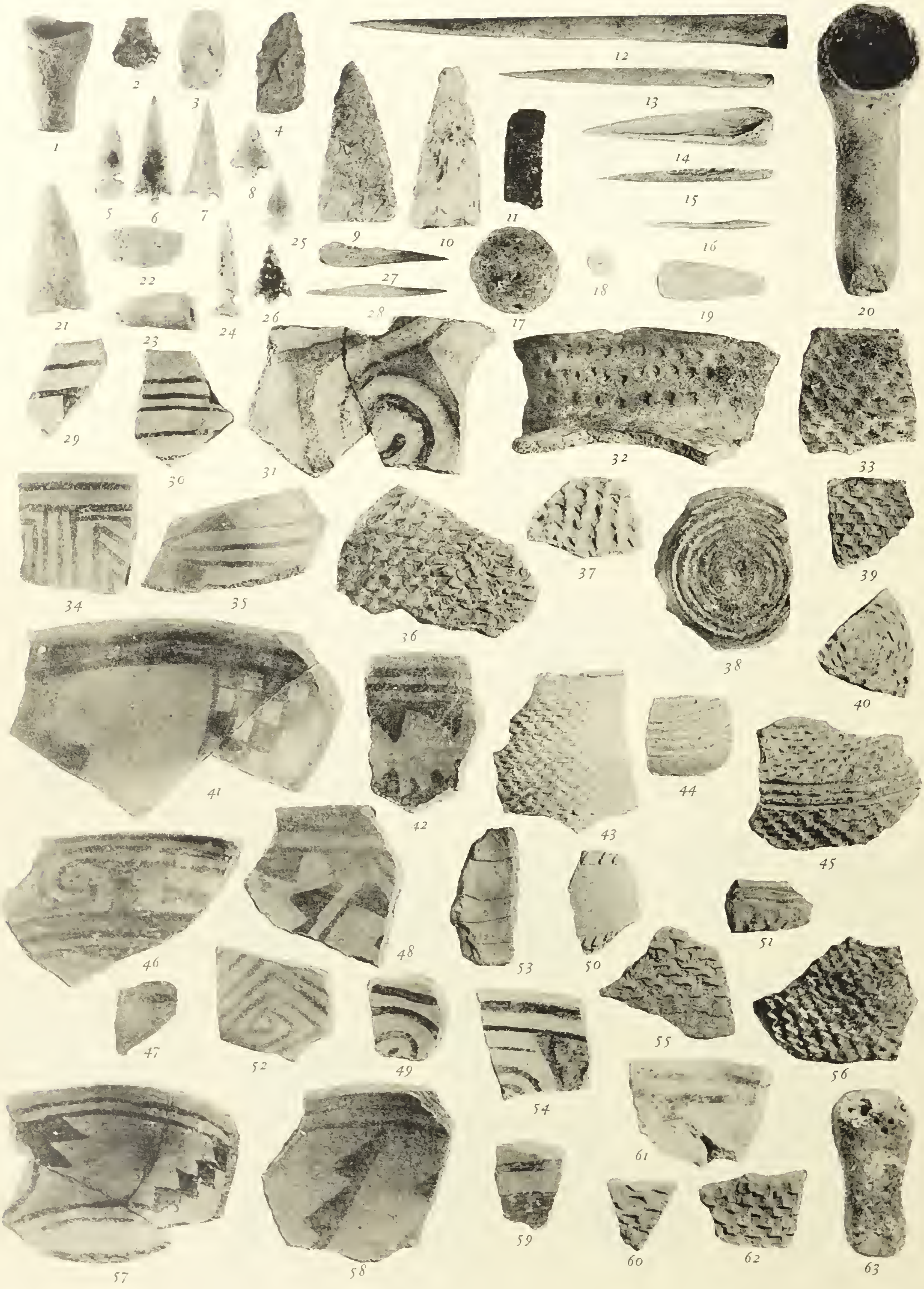
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PLATE IV

Marysvale 7, Kiva A.

POTTERY

34, 35, 41, 52, 54, 57, 58, Type II, A.
46, Type II, C.
42, 59, 61, Type II, D.
48, Type II, E.
49, Type II, F.
29–31, Type II, G.
47, Type II, K.
50, Type IV, B.
32, Type IV, J.
51, Type IV, K.
38, 44, Type IV, Q.
53, Type IV, R.
33, 36, 37, 39, 55, 56, 60, 62, Type IV, T.
40, 43, Type IV, U.
45, Type IV, V.
10, unclassified.

BONE

12–16, 27, 28, bone awls.
19, pendant.

STONE

2, 22, unclassified stone objects.
4, projectile point, Type 1.
5, 24, 25, projectile points, Type 2.
6, 7, 26, projectile points, Type 3.
8, projectile point, Type 4.
9, 10, 21, stone knives.
17, stone ball.
4, "spear" point.

MISCELLANEOUS

11, charred corn cob.
20, clay elbow pipe.
1, 23, clay straight pipe.
18, shell bead (*Olivella biplacata*).
63, figurine-like clay object.

PLATE V

a. Marysvale 7, Kiva B.

Pottery

10, unclassified.
8, 9, Type II, A.
11, Type II, D.
7, Type II, F.
5, 6, 12, Type II, H.
13, 15, Type IV, C.
17, 18, Type IV, P.
16, Type IV, T.
14, 19, Type IV, U.

Bone

1, whistle.
2, awl.

Stone

4, projectile point, Type 1.
3, projectile point, Type 5.

b. Marysvale 7, Kiva C.

Pottery

36, Type II, unclassified.
17, 20, 21, 25, 26, 33–35, 37, Type II, A.
27, Type II, B.
18, 19, Type II, G.
28, Type II, H.
38, Type II, K.
22, 23, Type IV, A.
31, Type IV, C.
39, Type IV, L.
29, Type IV, M.
40, Type IV, Q.
30, Type IV, S.
24, 41, Type IV, T.
32, Type IV, U.

Bone

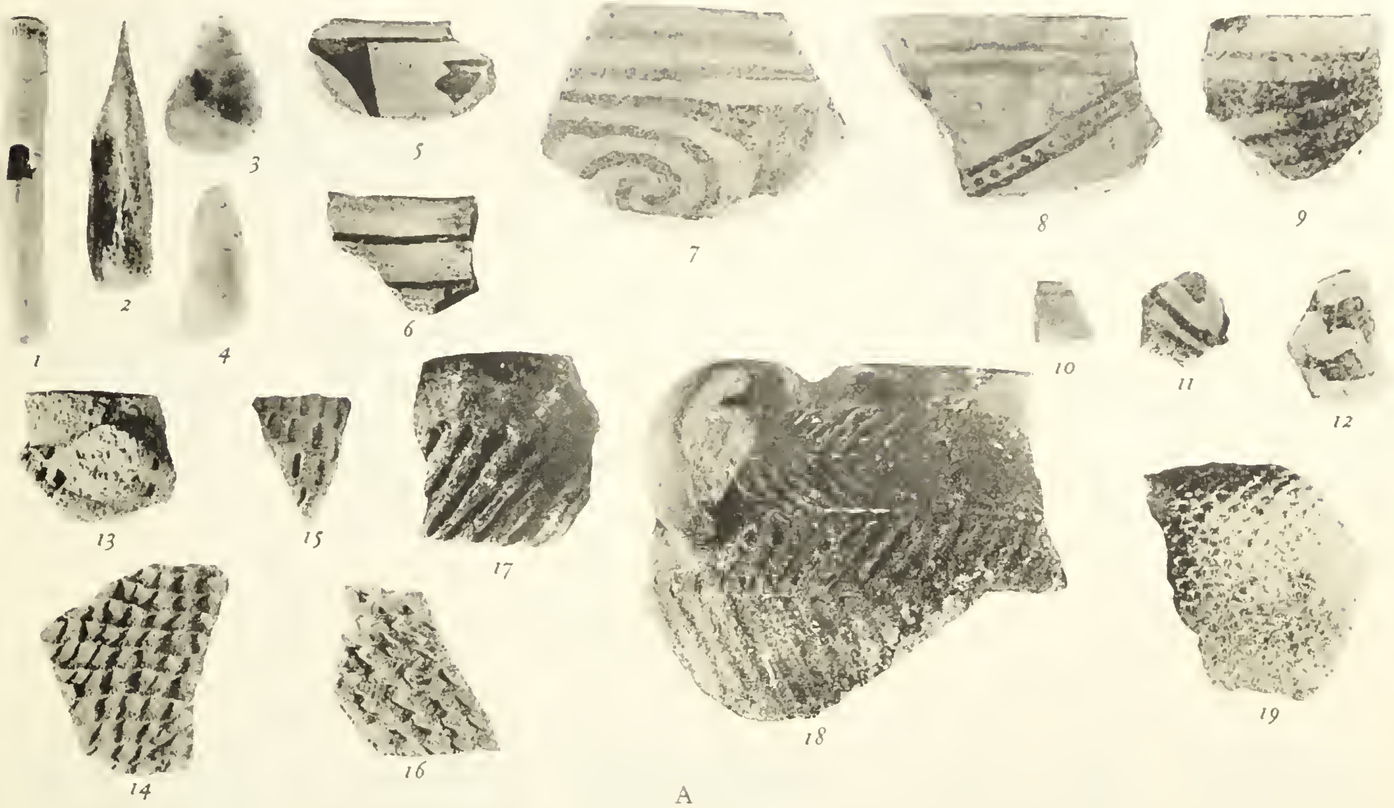
12, 14, awls.
15, whistle.
13, bone straight pipe.
16, rectangular bone game counter.

Stone

1, projectile point, Type 1.
3, 5, projectile point, Type 2.
8, 9, projectile point, Type 3.
4, 6, 7, knives, "spear" points.

Miscellaneous

2, unperforated clay disk.
10, 11, shell beads (*Olivella biplacata*).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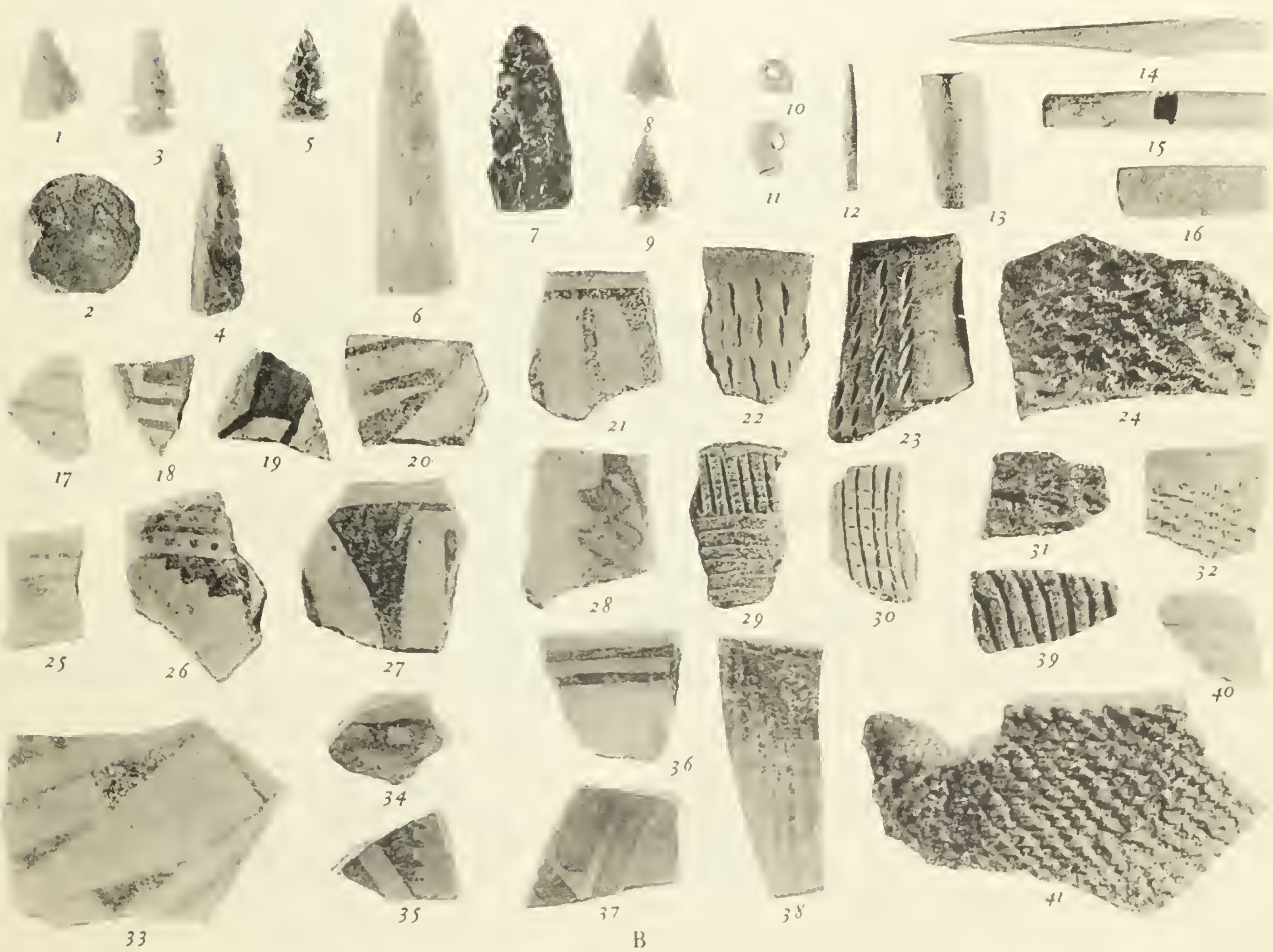
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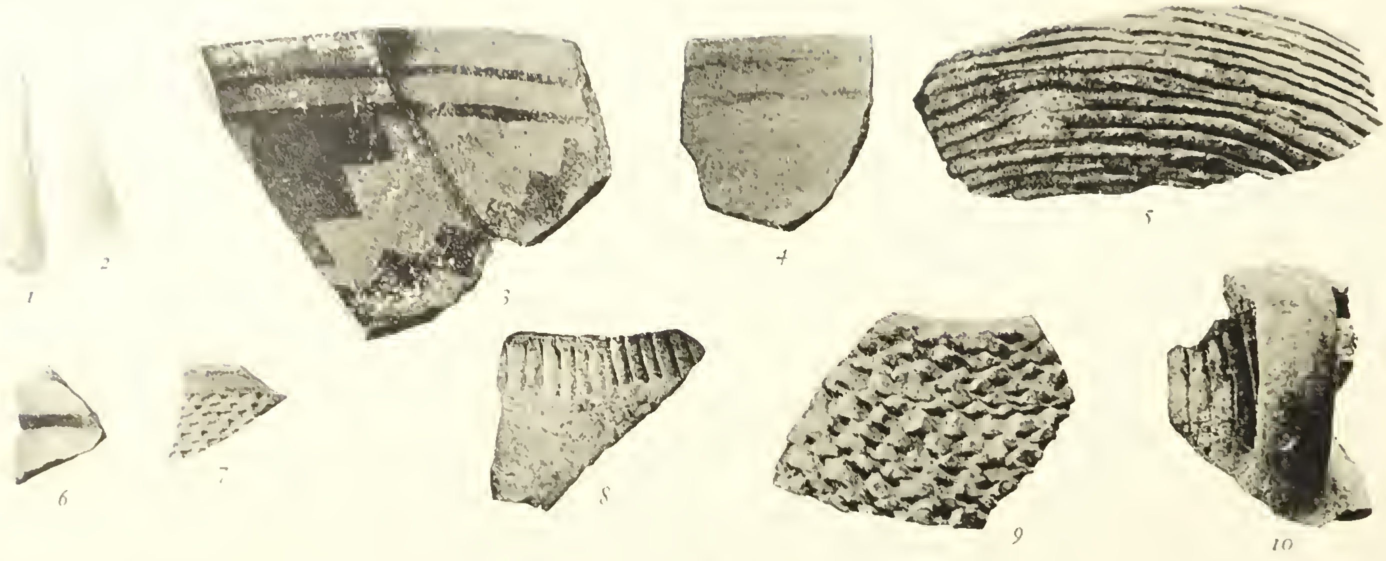
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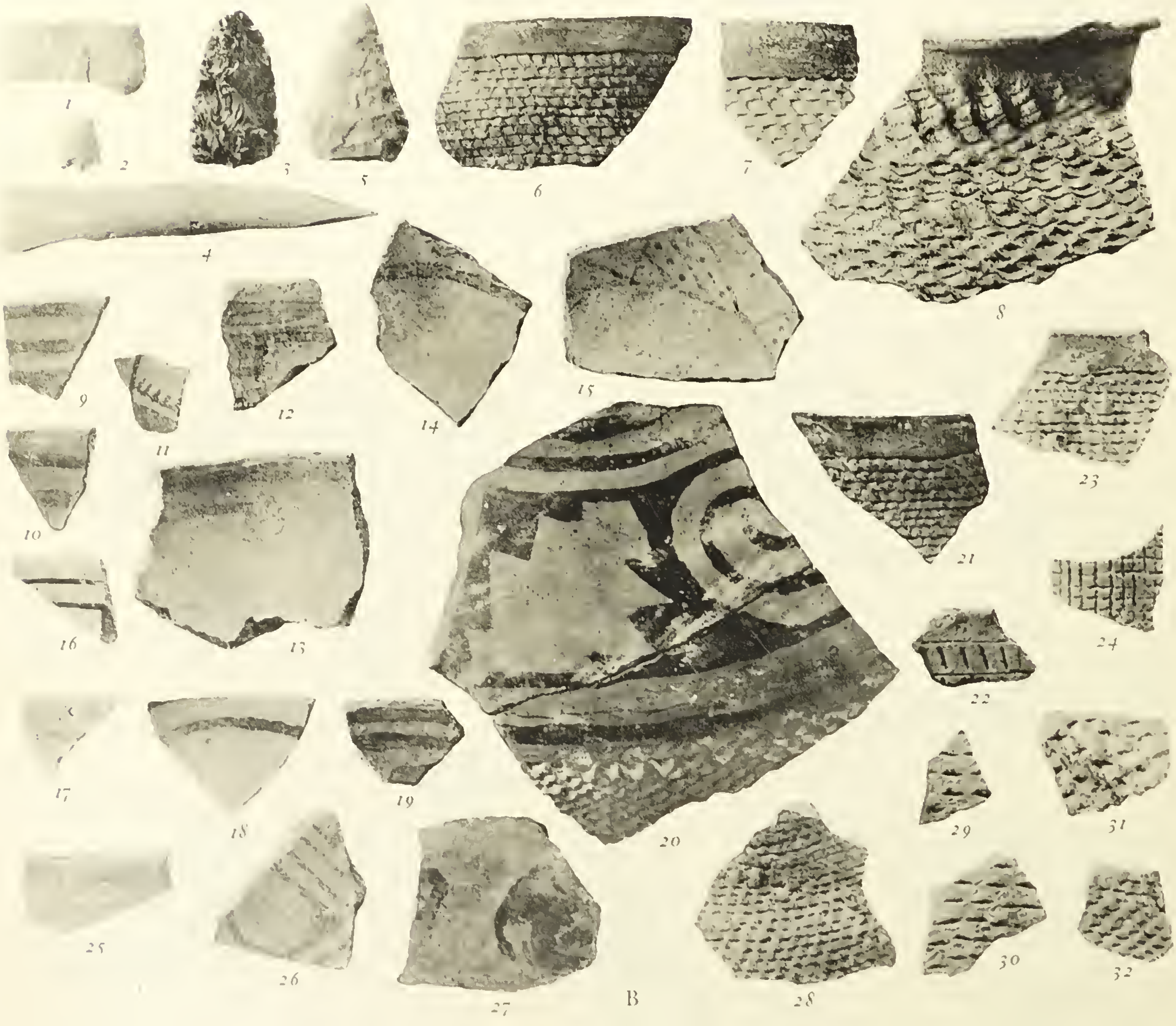
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PLATE VI

a. Marysvale 7, pit structure 1–14.

POTTERY

4, Type II, unclassified.
3, Type II, A.
6, Type II, G.
8, 10, Type IV, A and N.
5, Type IV, Q.
9, Type IV, T.
7, Type IV, U.

BONE

1, awl.

STONE

2, projectile point type 3.

b. Marysvale 7. 1–2, 6–15, House I, Room 1; 3–5, 16–32, House I, Room 2.

POTTERY

13, 15, Type II, unclassified.
10, 12, 14, 19, 25–27, Type II, A.
9, Type II, B.
11, Type II, E.
16–18, Type II, G.
20, Type III.
29, 30, Type IV, A.
22, Type IV, B.
31, Type IV, J.
24, Type IV, M.
8, Type IV, T.
6, 7, 21, 23, 28, 32, Type IV, U.
20, Type IV, W.

BONE

4, awl.

STONE

1, unclassified object.
2, projectile point, Type 3.
3, 5, knives.

PLATE VII

a. Marysvale 7. 2–5, 8–15, House II; 1, 16–23, House III; 6–7, 24–32, House V.

Pottery

8, Type I, unclassified.
20, Type I, M.
22, Type I, P.
15, Type II, unclassified.
9, 10, 14, 21, 23, 29–32, Type II, A.
3, Type II, B.
11, Type II, G.
16, 17, 19, 24, 27, Type IV, T.
12, 13, 18, 26, 28, Type IV, U.
25, Type IV, V.

Bone

1, awl.

Stone

3, unclassified.
5, 6, projectile points, Type 1.
7, projectile point, Type 2.
2, knife.

Miscellaneous

4, clay elbow pipe.

b. Tooele 1. 1–8, 24–27, House I, level 1; 9–18, 28–34, House 1, level 2; 19–23, 35–51, Pit 211.

Pottery

46–48, unclassified.
49, Type I, A.
31, Type I, C and I, M.
32, Type I, H.
25, 28, 29, 44, 45, Type II, A.
24, 30, Type II, G.
26, 27, 35, 41, Type IV, A.
40, 42, Type IV, C.
33, Type IV, D.
39, Type IV, E.
34, Type IV, F.
43, 51, Type IV, G.
50, Type IV, H.

Bone

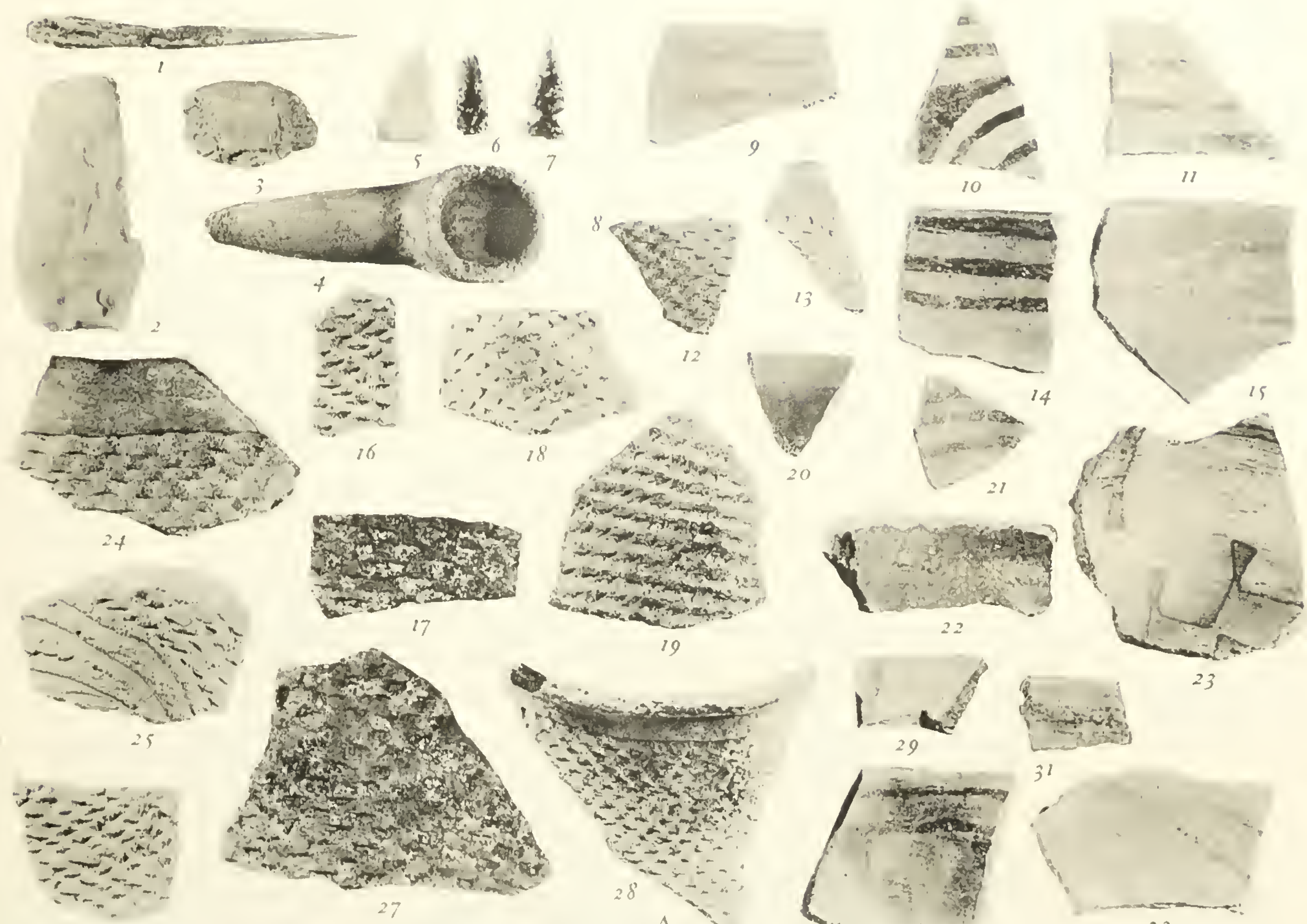
23, awl.

Stone

4, unclassified.
5, 16, projectile points Type 1.
3, 15, 20, projectile points Type 2.
1, 2, 22, projectile points Type 3.
17, projectile point Type 4.
18, projectile point Type 5.
7, 8, knives.
9, "spear" point.
6, obsidian scraper.
21, scraper.
14, stone disc.
19, stone object, use uncertain.

Miscellaneous

10, 11, perforated clay disk.
36–38, unperforated clay disks.
12, 13, shell beads (*Olivella biplacata*).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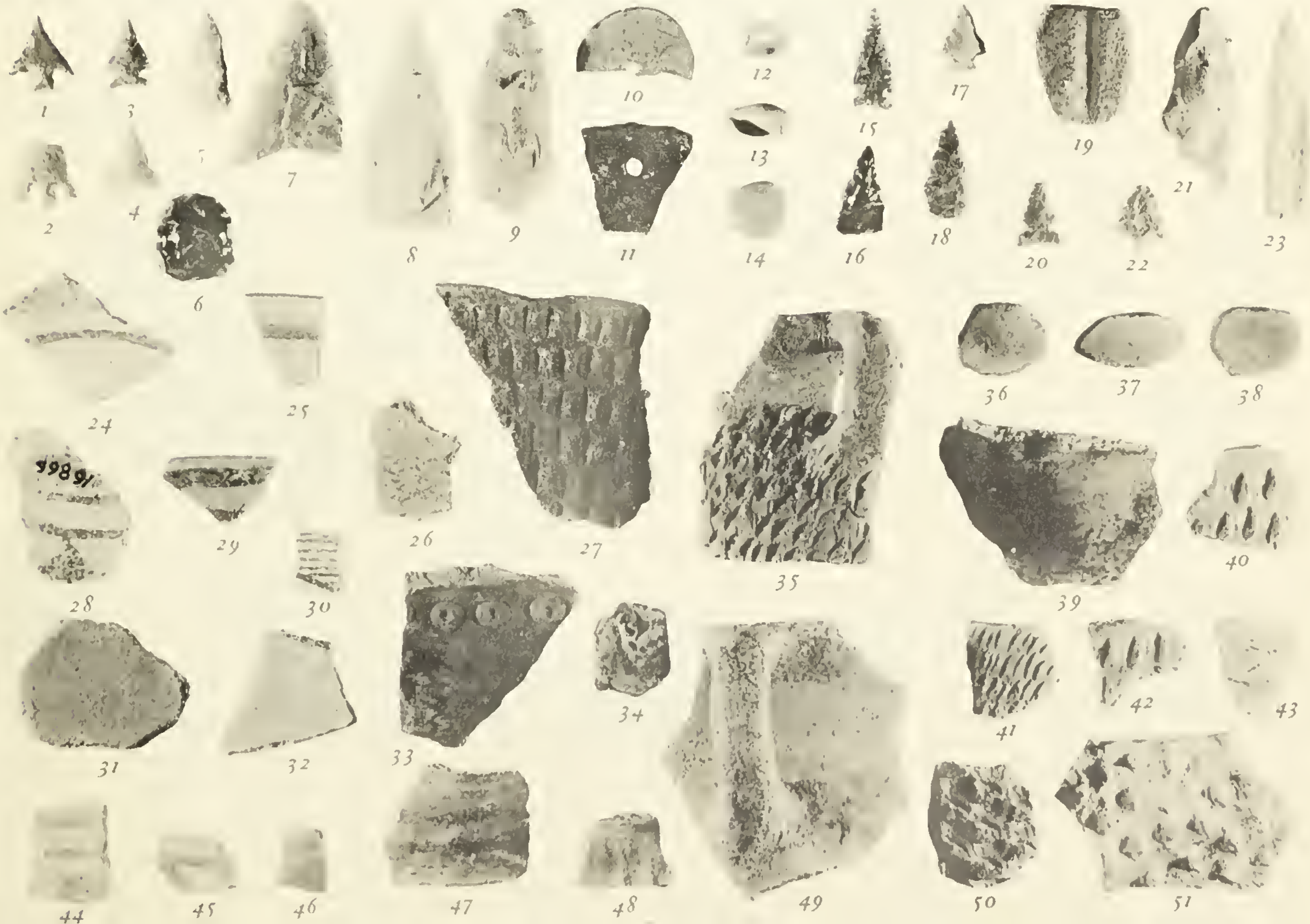
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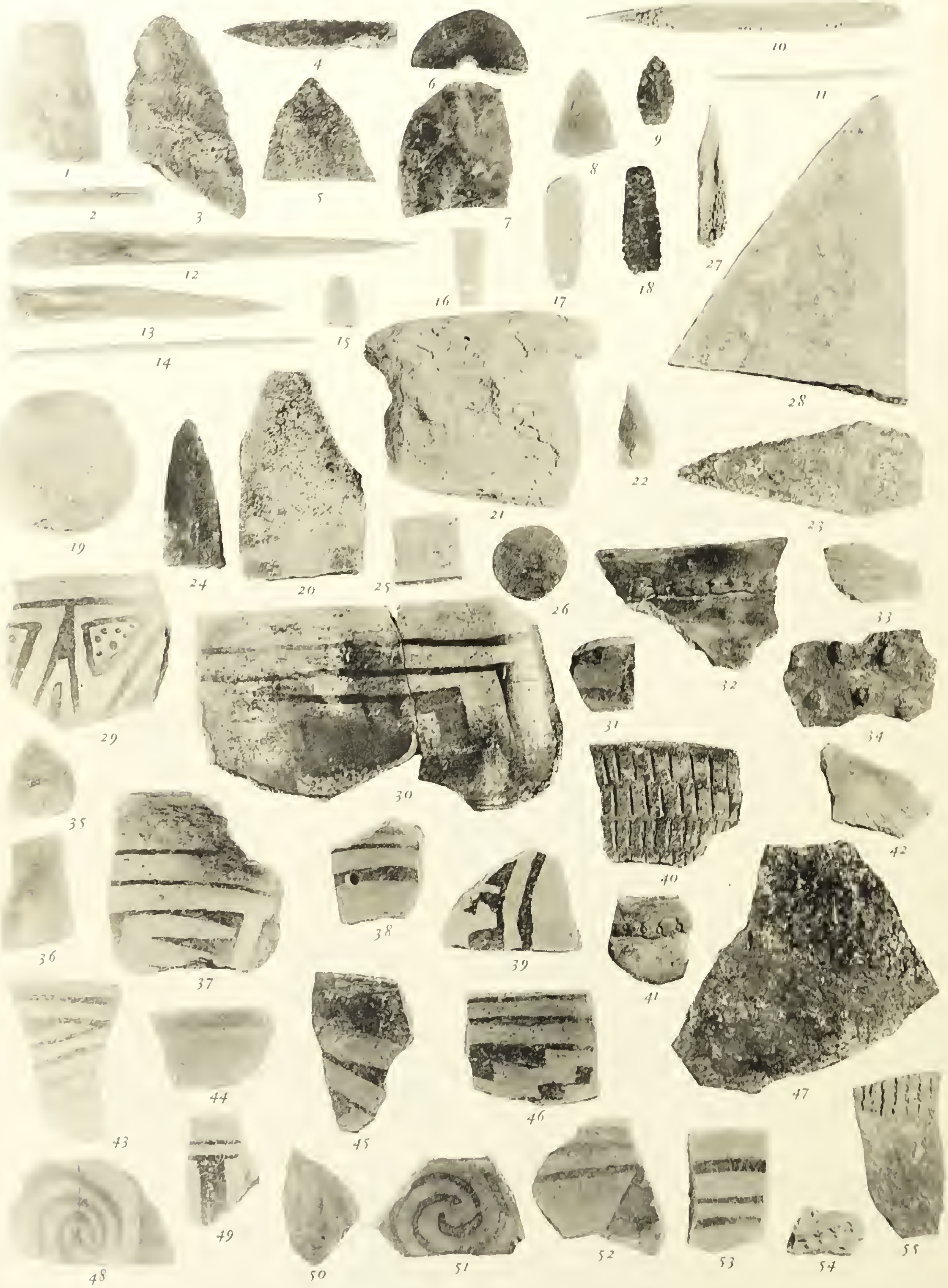
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PLATE VIII

Ephraim 1. 1, 29–30, House IV; 2–3, House I; 4, 32, 33, and 35, House VI, Room 1; 34, 37, 38 and 42, House VI, Room 2; 36 and 44, House VI, Room 2, below paved floor; 5, House VI, Room 2, second floor; 6–11, 31, 39, 40 and 45, House III; 12–23, 41, 43, 46, 47, 49, 51, 52, 55, House IIa; 24–26, 48 and 50, House IIb; 27–28, 53–54, between Houses IIa and VI.

Pottery

50, unclassified.
29, 31, 35, 45, 53, Type II, unclassified.
36, 39, 44, 46, 51, 52, Type II, A.
38, Type II, B.
30, 43, 48, 49, Type II, G.
37, Type II, H.
40, 47, 55, Type IV, A.
42, Type IV, B.
32, 41, Type IV, E.
34, Type IV, G.
54, Type IV, I.
33, Type IV, L.

Bone

2, 10–14, 27, awls.
15–17 perforated and unperforated bone pendants.

Stone

26, unidentified.
19, stone ball.
1, 3, 5, 7, 23, knives.
4, 24, knives "spear" points.
8, projectile point, Type 1.
9, 22, projectile points, Type 5.
20, 25, 28, stone slabs with red and yellow parallel lines.

Miscellaneous

18, charred corn cob.
6, perforated clay disk.
21, figurine-like object of clay.

PLATE IX

a. Plain gray ware vessel with pinched or indented corrugations. Marysvale 7, House V. Height, 12½ inches; diameter, 12½ inches. Type I, A with Type IV, C decoration.

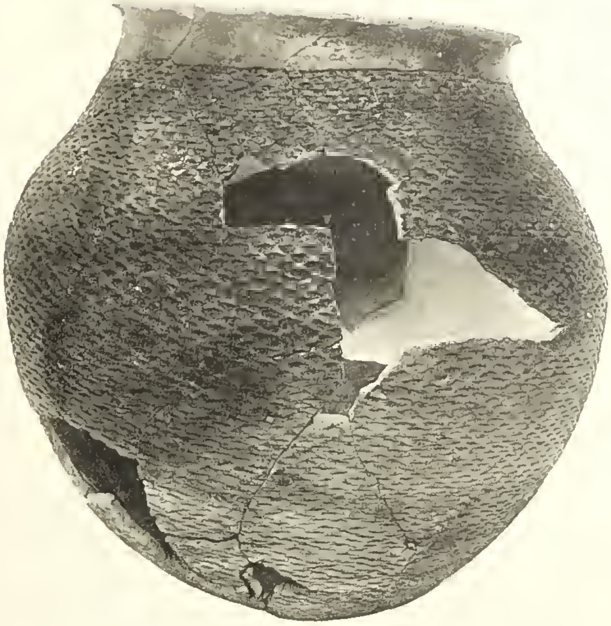
b. Black-on-gray ware jar. Marysvale 3, Trench 1. Height, 5¾ inches; diameter, 5¾inches. Type II, A.

c. Black-on-buff bowl. Marysvale 7, Kiva A. Height, 2¾ inches; diameter, 8⅛ inches. Type II, F.

d. Small Black-on-gray ware pottery vessel. Ephraim, House IIb. Height, 3 inches; diameter, 4½ inches. Type II, B.

e. Black-on-gray sherd. Marysvale 7, Kiva B. Height 3¾ inches. Type II, A.

f. Plain gray ware vessel with short, punched lines in series and indented applied band. Tooele 1, Pit 211. Height, 11¼ inches; diameter, 9½ inches. Type I, D with IV, C and IV, F decoration.



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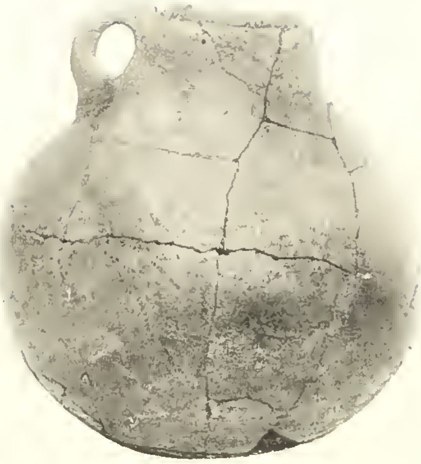

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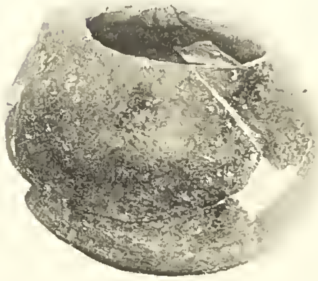

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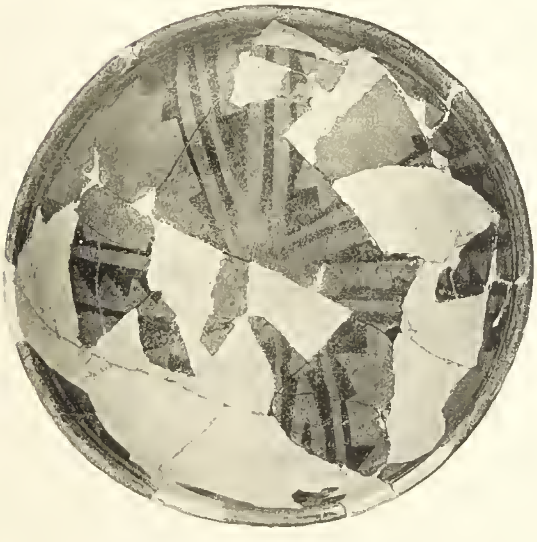

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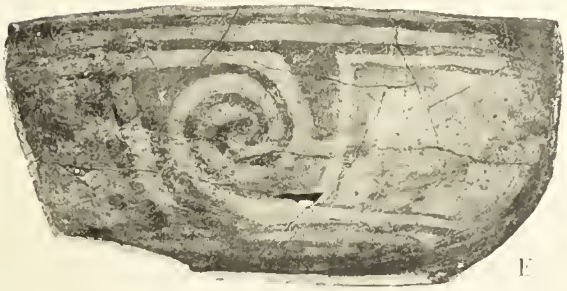

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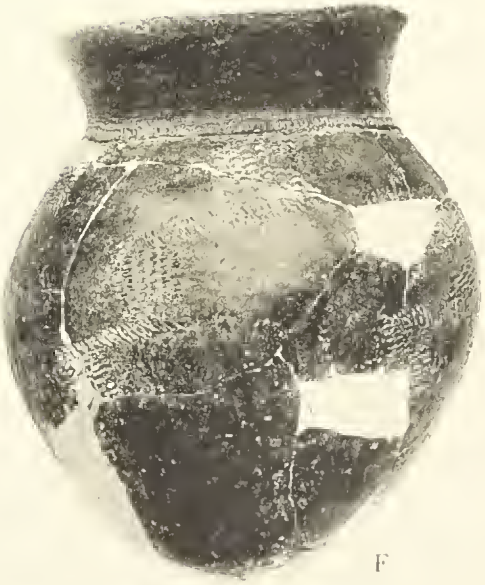

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FLINT QUARRIES – THE SOURCES OF TOOLS AND, AT THE SAME TIME, THE FACTORIES OF THE AMERICAN INDIAN

WITH A CONSIDERATION OF THE THEORY OF THE "BLANK"
AND SOME OF THE TECHNIQUE OF FLINT
UTILIZATION

PAPERS
OF THE
PEABODY MUSEUM OF AMERICAN ARCHAEOLOGY
AND ETHNOLOGY, HARVARD UNIVERSITY
VOL. XVII—NO. 3

FLINT QUARRIES—THE SOURCES OF TOOLS AND, AT THE SAME TIME, THE FACTORIES OF THE AMERICAN INDIAN

WITH A CONSIDERATION OF THE THEORY OF THE "BLANK" AND SOME OF THE TECHNIQUE OF FLINT UTILIZATION

BY
KIRK BRYAN

CAMBRIDGE, MASSACHUSETTS, U.S.A.
PUBLISHED BY THE MUSEUM
1950

PRINTED BY THE HARVARD UNIVERSITY PRINTING OFFICE
CAMBRIDGE, MASSACHUSETTS, U.S.A.

ACKNOWLEDGMENTS

IN ADDITION to those persons whose help is acknowledged in the text, I am grateful for my years of association with the Department of Anthropology and the Peabody Museum of Harvard University whose members have welcomed and also educated a geologist. To Dr. J. O. Brew I owe a special debt for his advice on this paper. On flintworking, I have profited from many conversations with Dr. Hallam L. Movius, Jr., and Mr. Lauriston Ward of the Peabody Museum and with Mr. Harper Kelley of the Musée de l'Homme, Paris, France.

A grant from the Milton Fund of Harvard has been helpful in financing this and other studies. I have also profited by an expedition to France in 1948 which was financed by a grant from the Viking Fund. The drawings, made by the scratch-board technique, reveal again the judgment and talent of Mr. Edward Schmitz.

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FLINT QUARRIES — THE SOURCES OF TOOLS AND, AT THE SAME TIME, THE FACTORIES OF THE AMERICAN INDIAN

WITH A CONSIDERATION OF THE THEORY OF THE "BLANK"
AND SOME OF THE TECHNIQUE OF FLINT
UTILIZATION

INTRODUCTION

CURRENT ideas in America concerning flint quarries, the methods by which they were operated by the aborigines, and the products produced are largely influenced by the work of W. H. Holmes who devoted a large share of his time from 1890 to 1904 to the investigation of quarries and mines operated by the American Indian. He presented his results in a series of papers admirably written and lavishly illustrated which all together form one of the great monuments of American archaeology.

Holmes held that flint quarrying as practised by American primitives, like modern quarrying, was a purely extractive industry. Therefore the quarried masses were reduced to a form, the "blank," which was carried away for later reworking into the whole series of usable shapes found in village sites and elsewhere. The remaining debris of the quarry site thus consists of irregular pieces of flint and of imperfectly shaped and broken "blanks," which are, therefore, the only "rejects." Tools, such as hammer stones and bone implements, also occur.

It is the purpose of this paper to outline in considerable detail several more or less interwoven theories regarding quarries. Two main theses are presented: (1) that many of the so-called "blanks" and "rejects" are usable tools, mainly axes, and that they were actually used; (2) that many flint quarries were not only sources of flint for export, but also industrial sites or factories to which materials such as wood and bone were brought to be worked in the presence of abundant tools. These main theses are supported and inspired by the very greatly expanded knowledge of typology developed in the past thirty years; by the recognition in the debris of quarries of numerous utilized flakes, and of shaped and utilized pieces of irregular shape; and by our present saner attitude toward the antiquity of man in America.

Holmes was strongly influenced by the contemporary stage of thought. At that time many were advocating an antiquity of man in America as great or greater than the antiquity demonstrated, in the years just preceding, for Europe. Brought forward as part of the supposed proofs were finds of implements that had, or were supposed to have had, a resemblance to the Palaeolithic implements of Europe. Holmes attempted to prove on geological grounds that these objects had no great antiquity. Further he attempted to demonstrate that many were forms rejected during the fashioning of more perfect forms which were in turn merely stages in the production of the stone tools of recent American Indians.

In the light of the very moderate antiquity of man in America advocated at present, stone types of the early Palaeolithic should not be expected, although approximations thereto exist. Our earliest stone complexes have their parallels in the very late Palaeolithic and Mesolithic cultures of Europe; but their inspiration and affinities must be with the, as yet, little-known stone complexes of Asia. Few would wish to advocate any very great antiquity for many of the stone implements of alleged "Palaeolithic aspect." The heavy bifaces with which Holmes was especially concerned have been found associated with artifacts of fairly late age not only by Holmes, but by others. So far as is known, no heavy bifaces have been found with the stone complexes that at the moment have the best claims to antiquity. The significant forms of the early American complexes appear to be projectile points. Our present concern is with the detailed and laborious task of building an archaeological sequence from the Sandia types of projectile points to Lindenmeier-Folsom and other contemporary forms to the late Eden-Yuma and thence to the notched triangular points associated with pottery. Scrapers, choppers, and other stone tools and objects may eventually have a significant place in this sequence. In some areas it has been demonstrated that large bifaces and choppers and also large blades are associated with pottery-using and comparatively recent cultures.[1] In other places similar bifaces have an uncertain position in our chronology, in part because they have not been given sufficient study. They have been dismissed as "blanks" or "rejects" to be associated with "blanks."

The "blank" was never strictly defined by Holmes; but his illustrations show bifacial, more or less oval, forms. Now in fact many types or sub-types occur; but, since they have all been considered "blanks" or "rejects," they have not been critically defined. Similarly Holmes' concept that a flint quarry existed solely for the production of exportable material has led to insufficient analysis of evidence which might prove that at least some of the quarries were industrial sites at which a variety of articles were made, and that a variety of flint tools were produced to facilitate this manufacture.

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[1] Toulouse, 1941.

THE THEORY OF THE "BLANK"

IN 1889 Holmes transferred from the U. S. Geological Survey to the newly organized Bureau of Ethnology. His first work was the famous excavation of the quarry site on Piney Branch in the outskirts of Washington, D. C.[1] Here a gravel bed containing quartzite boulders and cobbles was mined by undercutting the soft schist rock that underlay the gravel, thus bringing down masses of the gravel from which suitable quartzite cobbles could be selected. The waste was piled behind a trench kept open at the mining face. Holmes' excavation disclosed the methods of mining and also furnished large collections. Included in the mining waste were masses of chipped cobbles which indicate that the quarry site was also a "workshop" where the cobbles were reduced to chipped forms. Further the mass of waste was, at least at the site of his trench, covered by a later slope wash. Thus mining was an industry older than the slope wash. However, as Holmes considered that the slope wash might accumulate very rapidly on such a hillside, and as chipped quartzite objects similar to those found in the quarry waste occur over a wide local area and in village sites of the local Indians, he concluded that the quarry was operated not many generations ago. It is obvious that this conclusion will need to be re-examined when a local archaeological sequence has been attained. It is, however, likely that the quarry was operated for a period of hundreds rather than thousands of years.

In collecting from the mining waste he rejected chips and also some of the cores from which chips were derived. He selected "tortoise backs" or boulders chipped in from the side so as to make one side a crested ridge. He also selected "double tortoise backs" which were boulders chipped on both sides and therefore bifaces. Some were thick and some thin. These forms had been the subject of much discussion and were considered by some of his contemporaries to be "Palaeolithic" in type and, therefore, of great antiquity. He postulated that these forms were a series in the production of a more or less oval blade 4 to 5 inches (11 to 13 cm.) long and ½ to ¾ of an inch (1 to 2 cm.) thick. Each member of the series was a rejected piece, abandoned because the artisan encountered obstacles in the production of the required form. Many were broken into halves by more or less clean breaks across the long axis. The ideal "blade" [2] was thin and was produced by percussion. He conceived that it was then reworked by pressure flaking to produce projectile points, knives, scrapers, perforators, and other implements of the kinds commonly found in nearby village sites. The reworking was, however, not done at the quarry site, but at some convenient workshop elsewhere. Thus he explained the caches of "blades" occasionally found in the area as having been buried by the owner near or within some settlement to preserve the "quarry water," or original moisture in the flint, and, therefore, the presumed ease of working.

He supported this concept by citing the random disposition of the chipped forms in the quarry refuse as indicating that they were thrown away as items of no value. The small number of relatively thin bifaces which approach the shape and thinness of "blades" was also cited as evidence that this was the desired form and that nearly all these thin "blade-like" bifaces were carried off for use in the final process of making "blades."

The foregoing résumé of Holmes' theories presents in perhaps too brief a form his ingenious analysis of the results of his investigation. The complex of inter-related theories was retained by Holmes and applied by him to the interpretation of quarry sites later investigated.[3] The ideal quarry form was later called a "blank," but no new ideas were introduced.

---

[1] Holmes, 1890a.

[2] Holmes used the term "blade" for a thin bifacially chipped elongate artifact usable as a knife or a spear point; whereas in Europe a blade is a parallel-sided flake in which the length greatly exceeds the breadth. It is usually struck from a trapezoidal core. A "flake" tends to be oval and the ratio of the breadth to the length is usually high.

These theories may be summarized in his own words in his publication of 1890:

1. "Every implement resembling the final form . . . made from a boulder . . . must pass through the same . . . stages of development. . . .[4]

2. ". . . when this thin blade was realized the work of the shop and the only work of this shop . . . was ended." [5]

3. "The neat, but withal rude, blades, and, they only, were carried away . . ." [6] ". . . the blades were the exclusive worked product of the quarry . . ." [7]

4. "Further work, additional shaping . . . was carried on in other fields." [8]

5. "The ordinary cache of stone implements is a cluster or hoard . . . which has been secreted or deposited in the earth by the owner . . . who for some reason never exhumed it." [9]

6. ". . . the objects usually contained in caches . . . are quarry products — unfinished tools — varying in character with the material, the process, and the habits or needs of the people concerned . . . roughed out in numbers . . . made . . . portable . . . carried . . . to the villages and buried in damp earth, that they might not become hard and brittle before the time came for flaking them into the final forms . . ." [10]

In 1897 Holmes brought together all of his researches on quarries in eastern United States in an elaborate paper. He repeated again his thesis that the quarries near Washington existed solely for the production of oval "blades" by percussion chipping, and that all other implements were derived from these by further flaking, mostly by the pressure technique. However, he illustrates and remarks on four cores or "masses of raw material from which flakes have been removed to be used as knives, etc." [11] He dismisses this evidence that flakes were utilized, either directly or as a source of material for small implements, although he should have been aware of the use of obsidian flakes, or blades in the European sense, as razors in Mexico because this information had been previously published (1896).[11a] He also disregarded the protests of Volk (1894) and others.

He described and figured end and side scrapers from "Tidewater" village sites and admitted that these implements were not of "leaf-blade genesis." [12] These implements were obviously derived by striking a heavy flake from a core but this method of making the "blank" for an implement was ignored by Holmes. As late as 1900, he described the obsidian mines of Hidalgo, Mexico, and described and figured scrapers obviously made by this technique, without changing his thesis that all implements are derived from blades and blades from heavy bifaces.

Holmes also noted that at village sites near Little Falls on the Potomac, boulders of quartzite were sharpened by flaking. Some are "choppers" and some are "picks." [13] One is a complete biface. Holmes admitted [14] that some of these tools were undistinguishable from what he had called quarry "rejects." They could be distinguished only because they showed signs of use and were found at village sites, not at quarries. He did not believe that they had been carried from the quarries, but considered that they were locally produced. This inference is wholly unsubstantiated and can be neither confirmed nor denied.

Holmes also investigated a quarry in rhyolite near Maria Furnace, Penn.[15] Here he collected bifaces almost identical in shape with the quartzite bifaces.[16] Some of the quarry bifaces are, however, relatively narrow and delicate [17] and distinctly different from the quartzite "blanks" and "rejects."

---

[3] Holmes, 1891, 1894.

[4] Holmes, 1890a, p. 13.

[5] Holmes, 1890a, p. 13.

[6] Holmes, 1890a, p. 13.

[7] Holmes, 1890a, p. 18.

[8] Holmes, 1890a, p. 13.

[9] Holmes, 1890a, p. 18.

[10] Holmes, 1890a, p. 18.

[11] Holmes, 1897, p. 56.

[11a] Fowke, 1896, pp. 47–178.

[12] Holmes, 1897, pp. 85–86 and pl. XXXIII, a, b, c, f, and h.

[13] Holmes, 1897, pls. XLIX and L.

[14] Holmes, 1897, pp. 91–92.

[15] Holmes, 1897, pp. 74–77.

[16] Holmes, 1897, first two on left, pls. XXVIII, XLIII, a–d.

[17] Holmes, 1897, pl. XXVIII, five on left.

Two bifaces [18] are in form like the so-called "war club spike" of Texas. "Blades" of this rhyolite that are found in caches [19] are very long and narrow with blunted ends and parallel sides. They are so different from the leaf-shaped "blade" as to imply a different use and even that they may have been made by different people.

Mercer (1897) after excavating a quarry in argillite followed Holmes' theory that heavy argillite bifaces in the quarry debris are "wasters" or "rejects" and asserts that they have no sign of use. He believed that the Indians carried away all the thinner bifaces or true flakes except two that he found and which he believed were lost by a careless owner. These thinner "blanks" were reduced to "blades" by processes other than percussion. However, he believed that he could distinguish between "rejects" of quarried argillite and "rejects" made from loose fragments, pebbles, or argillite picked up in streams. At a nearby village he excavated from a lower level "riverside" "rejects" only, and from an upper level "quarry" "rejects." Thus he inferred a considerable duration of the occupation of the village and a shorter life for the quarry. It seems remarkable that quarry "rejects" should be found in the debris of even a nearby village, unless they had a use. As is hereafter shown Mercer rejected Holmes' theory that smaller forms were derived from the "blank."

The inconsistencies in Holmes' statements and illustrations raise the question as to whether or not all the utilized forms of the quarries investigated by him were collected. They also leave many doubts as to whether or not all the quarrywork at these sites is to be attributed to one group of people operating over a relatively short time. It seems likely that a span of several hundreds of years is involved. Types of implements and flaking methods may have changed during this time interval. Some of the discrepancies in Holmes' statements might be explained by such an hypothesis. Certainly Holmes' all-inclusive group of theories is not wholly substantiated by the facts published by him in 1897, as pointed out above and as noted in reference to the "Spanish Diggings"; nevertheless he retained and repeated his theories as late as 1900.

The reader will note that Holmes mentioned the presence of cores whose significance he had not considered. Also he did not mention flakes. The process of making bifaces must have produced innumerable flakes. Are we to assume that these flakes and those struck from cores were not utilized? Can the sole product of the quarry have been the thin ovate "blade"? Was it the sole original shape from which all other chipped implements were manufactured by pressure flaking?

These questions have long troubled the writer and cannot be definitely answered for the Potomac area without restudy of the sites. However, other quarries have been examined by me including one to which Holmes applied his theories. The facts brought out by these necessarily brief examinations are first reviewed, and thereafter the questions here raised are re-examined.

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[18] Holmes, 1897, pl. XXX, b and c.

[19] Holmes, 1897, pls. XXIX and XXX, a.

THE "SPANISH DIGGINGS" IN OKLAHOMA

GENERAL STATEMENT

THE "Spanish Diggings" or Peoria Quarry of Oklahoma is best reached by going north from the post office of Seneca, Missouri, on the main street and a paved road, U. S. 43, for .9 miles; thence northward on a graded road up a valley to a plain on which the road trends due north on the Oklahoma-Missouri boundary for 4 miles, to a crossroad. Turn west on a graded road that runs west for 2.5 miles over the plain and then bends slightly in rougher country. The total distance is 7.7 miles. As described by Holmes (1894), the quarries occupy the top of a knoll overlooking to the west a stream which is a tributary of Spring River, in turn a tributary of Neosho River. The holes dug by white men looking for the supposed Spanish mines were visible on September 19, 1942, during my visit.[1] A few holes have recently been dug for "tiff" or barite. The round pits and great spreads of broken flint are easily seen under the shade of the open oak woods. Holmes distinguishes between "quarry pits," nearby circular "workshops" where flint was shaped, and more distant "trimming shops." These distinctions are hardly visible at the present, although they may have existed before the area became the haunt of local collectors.

A surface survey of the site was made and some of the more significant pieces are illustrated in figures 2–10. Investigation was facilitated because a recent grading of the road afforded a section through the debris that had been thrown out during the quarrying operations in several nearby pits.

HOLMES' RESULTS

At this site Holmes (1894) made extensive collections totaling thirty boxes and some of his statements concerning them are interesting. ". . . in the thirty boxes . . . no single piece . . . could be called an implement." [2] ". . . no finished flaked implement . . . has ever been collected." [3] "There are no indications of earlier and later periods of occupation." Some shops are newer than others but the difference in time is not "more than a few generations." ". . . as a rule little or no specialization of form was attempted on the quarry sites. If completed articles or implements are found intermingled with the refuse on any such site, it is because they were employed in the work of quarrying and shaping or because they were accidentally present and lost. The ordinary and almost the exclusive shaped product of these sites, aside from hammerstones was some form [of] blade or disk — a blank — intended, in most cases, no doubt, to be subsequently elaborated into an implement of more highly specialized form." [4]

"The quarry was the factory wherein the raw material was prepared for market, and the shapes were carried only far enough to make transportation easy and profitable." [5]

"If flakes were removed [from cores] to be used in arrow-making they were carried away . . . for there is not a trace of the manufacture of small articles at this site, the smallest unbroken worked piece found in several days' examination being more than 3 inches long." [6]

The forms so lavishly illustrated by Holmes consist of several shapes all of which are considered "blanks." He distinguished them as follows: (1) oblong oval "blade" which "prevails"; (2) rudely triangular biface; (3) discoid or circular biface; (4) cores of trapezoidal cross section and general circular outline; (5) biface with parallel sides and squarish ends, "chisel-like"; (6) possibly completed forms consisting of three to four "handsome blades"; (7) "rejects" consisting of a well-illustrated series of large bifaces.

---

[1] Dr. W. F. Barnard of Seneca, Missouri, kindly gave precise directions for reaching the site. In the investigation of this quarry and of the Alibates Quarry described in the following chapter I was assisted by Franklin T. McCann and Sheldon Judson.

[2] Holmes, 1894, p. 15.

[3] Holmes, 1894, p. 16.

[4] Holmes, 1894, pp. 13–14.

[5] Holmes, 1894, p. 15.

[6] Holmes, 1894, p. 18.

Holmes gives an illustration in his plate x, here reproduced as figure 1, of two cores, or to use his term "nuclei." These cores have a typical trapezoidal cross section and flat top and base. I saw several and collected one core of this type. No one can doubt that these cores are evidence that straight narrow flakes were produced. Flakes of this type, known to European typologists as blades, are common.

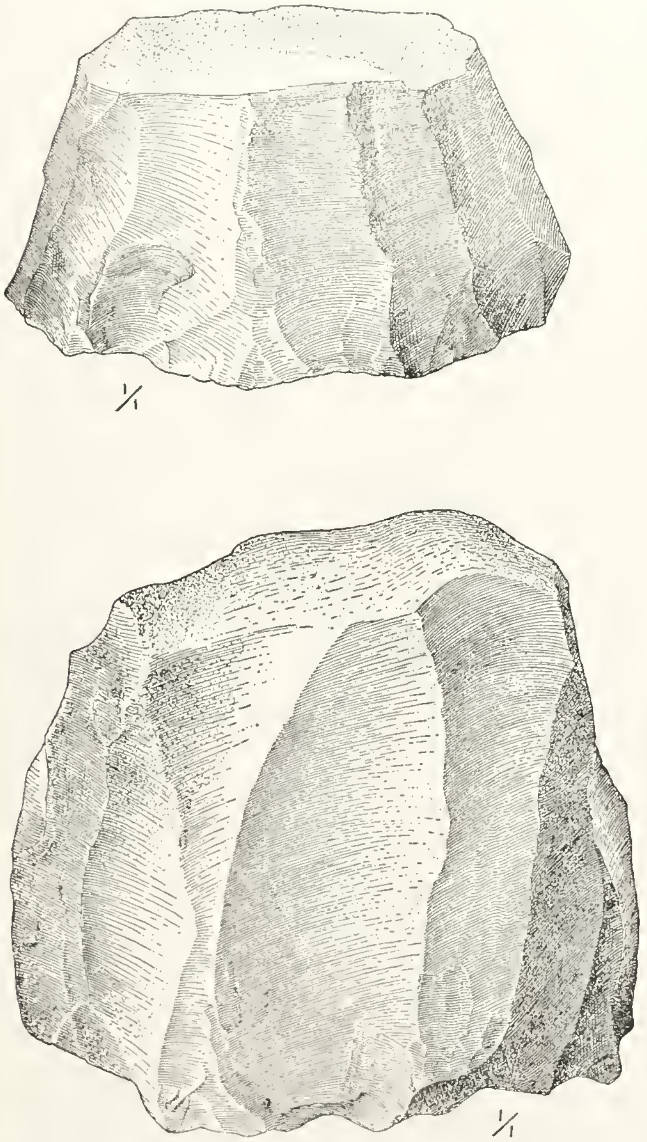

Fig. 1. Cores. "Spanish Diggings" (Peoria) Quarry, Oklahoma. From Holmes, 1894, pl. x.

That some of them were utilized on the spot is evident from the finding of a partly shaped and utilized scraper made from such a flake, figure 2. Most modern authorities would agree that these straight flakes (blades) are ideal for the manufacture of arrow points.

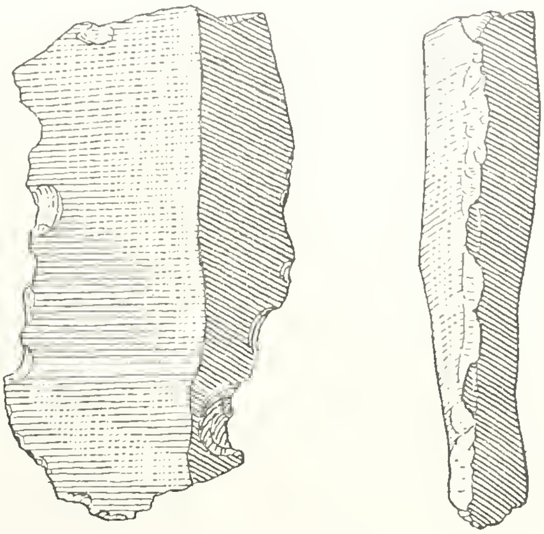

Fig. 2. Utilized flake or blade. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (5.4 cm.)

That arrow points are generally made from flakes and not from cores is evident from a consideration of the shapes of many of them. Also Mercer (1897) cited nine authors who saw Indians making arrow heads from flakes. On the basis of this data he classifies the methods of making arrow heads, blades, and flakes into five types:

a. by direct percussion (hammer stones)
b. by indirect percussion (chisels or punches)
c. by indirect pressure (notched bone or tweezers)
d. by impulsive pressure (pressure with a lever aided by a blow)
e. by pressure aided by heat (heated stone pressed against flint)

According to Pond (1930), Skavlem made arrow heads from irregular flakes by pressure flaking with a bone tool in times ranging from one and one-half to ten minutes (see his pls. 11, 14, 24, and 46). Nelson (1916) states that Ishi, a California Indian, made arrow heads exclusively from flakes and took about half an hour. Bourke (1890) states that the Apaches made arrow heads by chipping (pressure flaking) small fragments from suitable pieces of material with a tool of deer or elk horn. He picked an Apache at random and induced him to make arrow heads from pieces of chalcedony picked up from the ground. He made four arrow heads in five, six, seven, and eight minutes each. Bourke states that an expert could have made them in less time. These data indicate that Holmes' theory of the derivation of the arrow head from a blade-like core is erroneous.

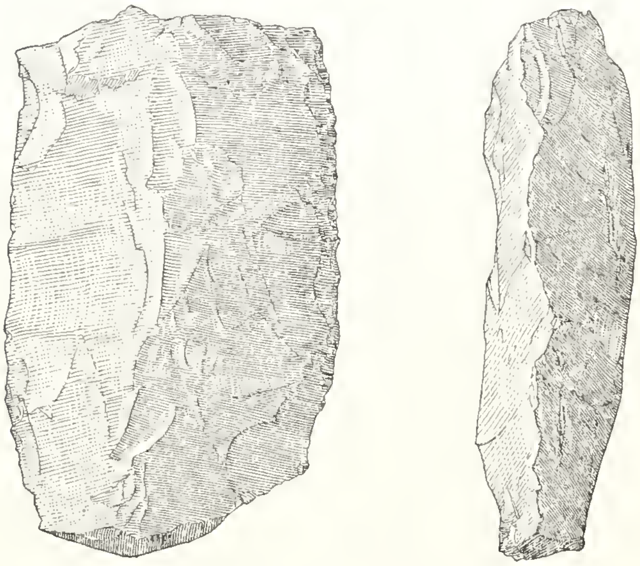

Fig. 3. Large biface or broken ax. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (13.7 cm.)

Contrary to Holmes' statement that no finished tools are found, is the find of an arrow point, figure 21, *a*. It is made of flint identical in type with the local flint. The point has been broken off violently, apparently after the form was complete. The presumption would be that this point was made at this site. Even if made elsewhere it was discarded at the quarry workshop, presumably in favor of a newly made point.

The triangular and discoid bifaces of Holmes' list [7] also appear to be cores, although usable as scrapers.

The oblong oval blades, no. 1 of Holmes' list,[8] and "handsome blades," no. 4, are strictly usable implements. In fact the "handsome blades" are large thin ovate bifaces, frequently called "hoes," which have been found over a wide area in Missouri and adjacent states. A broken biface of this type was found, figure 21, *b*.

There remain of all the different "blanks" considered by Holmes only the heavy bifaces, nos. 5 and 7 above, which he admits resemble some of the Palaeolithic hand axes. A few, as the one illustrated in his plate VIII, are slightly notched as if for hafting. He states that he cannot be sure whether these notches were made for hafting or not, as the notches may be "the result of repeated attempts to reduce the great thickness of the middle part of the specimen . . . first on one edge and then on the other." [9]

I found relatively few of the large heavy bifaces which presumably have been carried off by persistent collecting in the intervening years. My specimens seem to show use as axes or picks by reason of secondary chipping on the ends (figs. 3 and 4). In this respect they would resemble the bifaces of similar size and quite similar shape of the Cerro Pedernal Quarry in New Mexico (Bryan, 1939). These I have already described as axes and have asserted that many show the effect of use.

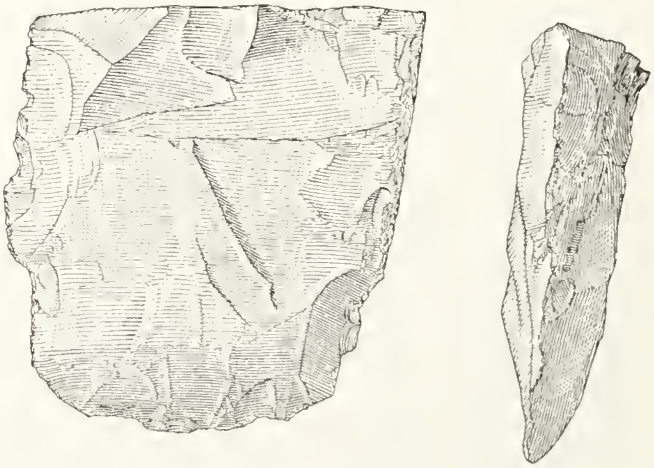

Fig. 4. Large biface or broken ax re-used as a scraper. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (14.1 cm.)

The remarkable feature of my collection is the large number of utilized flakes and utilized irregular fragments and blocks. Most of these were obtained from the refuse mound cut by the road. They are pale buff or yellow buff in color and are stained red from the clay in which they were imbedded. Specimens from the surface are gray with black lichen and blackish stains from decomposing organic matter.

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[7] See p. 8.

[8] See p. 8.

[9] Holmes, 1894, p. 17.

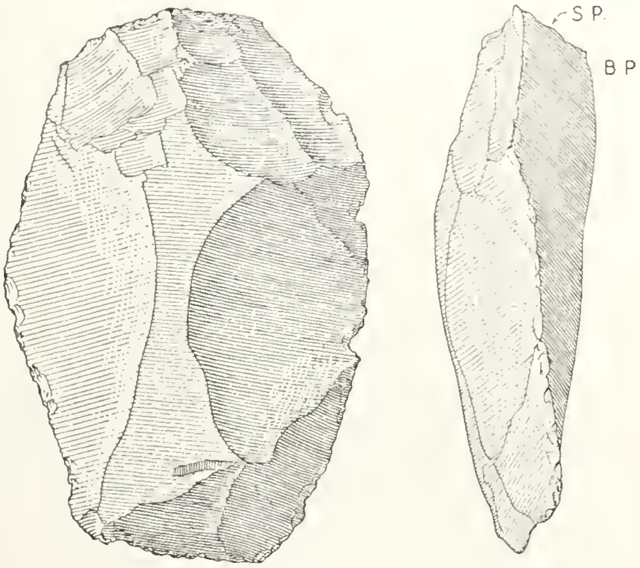

Fig. 5. Flake struck from a biface by Clactonian technique and utilized as a scraper. *SP*, striking platform; *BP*, bulb of percussion. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (12.0 cm.)

One of the flakes, figure 2, has already been mentioned. Rounded by retouch at one end and obviously utilized, it is a straight flake struck by systematic chipping from a trapezoidal core. Other chips, similarly made, show broken edges as if used. Other chips are less systematically made, and have stronger bulbs of percussion as if struck in the making of bifaces. Some of these show utilized edges.

Several flakes have been struck from bifaces. One side shows the bulb of percussion and the smooth concoidal break; the other the facetted surface of a biface (fig. 5). The platform was apparently a smooth break, and there is no evidence of a prepared platform. These flakes are then made by the Clactonian technique.[10] Other flakes are obviously struck from cores (figs. 6 and 7). They also have been used but it is not quite clear whether they are trimming flakes or whether they have been formed by the Clactonian technique.

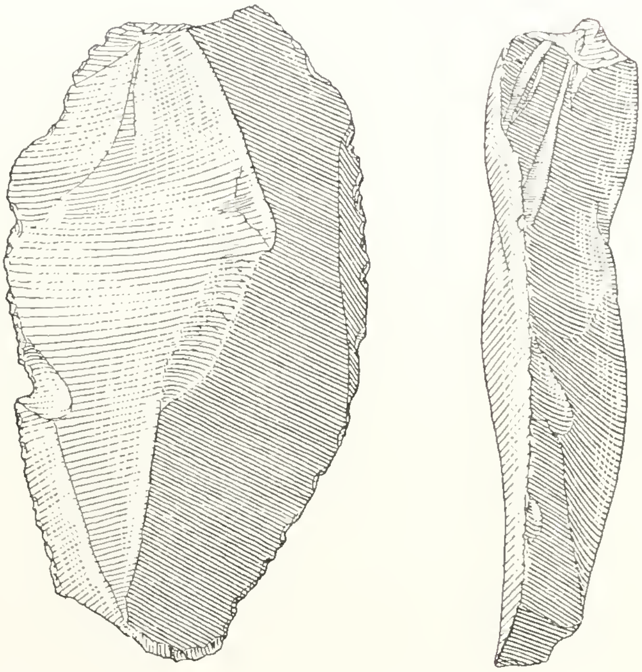

Fig. 6. Flake struck from a biface and utilized as a scraper. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (9.8 cm.)

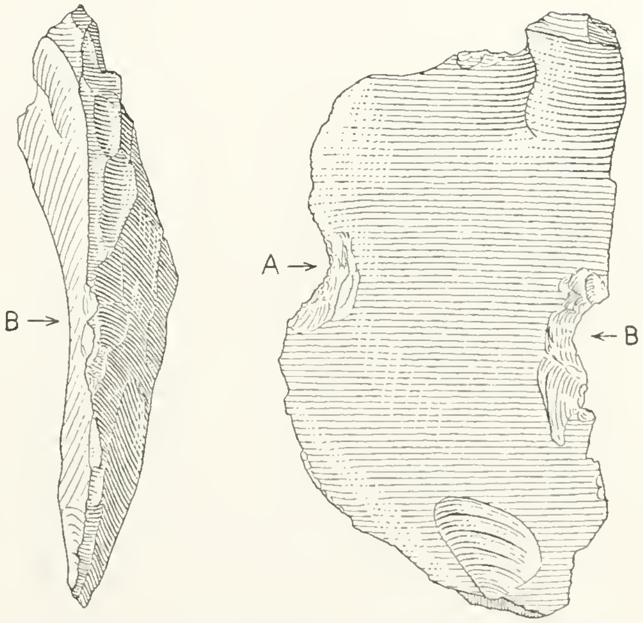

Fig. 7. Flake struck from a biface and modified for use as a scraper. *A* and *B* prepared recesses for use as concave scraper. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (9.2 cm.)

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[10] See p. 25.

Other flakes, quite irregular in form, have a carefully retouched edge, or edges, as in the heavy flake shown in figure 8. Here one edge has a scalloped prepared recess like the two recesses of the scraper shown in figure 7. These concave scrapers are obviously intended for forming or smoothing a rounded shaft or edge.

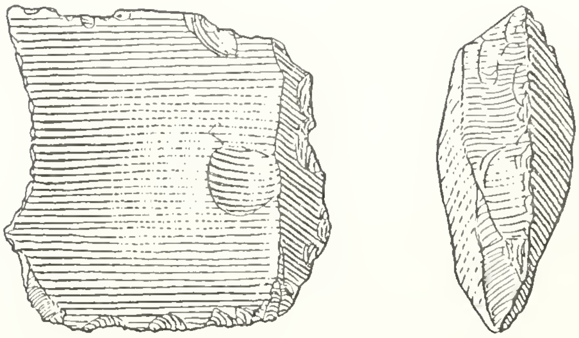

Fig. 8. Thick irregular flake with prepared concave edge on left, also shown as an edge. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (3.8 cm.)

Some of the most remarkable specimens are blocks of flint bounded mostly by original joint planes, yet having prepared and utilized edges. The one illustrated in figure 9 fits easily into the hand and could be used as a gouge, provided it were not pressed so hard into a resistant substance as to break the thin prepared edge.

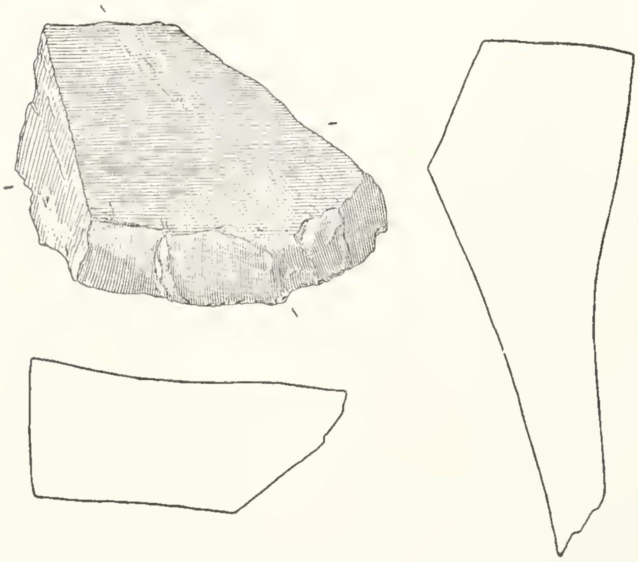

Fig. 9. Block of flint with prepared and utilized edge. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (12.5 cm.)

There are also five specimens which form a definite type (fig. 10). Each has a flat base made by one large or several smaller breaks. Each has at one end a carefully prepared edge, *A*, coming down sharply to the slightly concave base. Also each has a thick flaked body suitable for holding in the hand. They range from 3 to 4.5 inches (8 to 11 cm.) in length and from 1.75 to 2.25 (4 to 6 cm.) inches in height. This is obviously a carefully prepared tool suitable for scraping. It is a rough carinate or core scraper prepared for use in the hand and actually utilized. If it was used on wood it could easily have been a rough planer. The small thick and somewhat irregular flake shown in figure 8 has one side carefully prepared to form a steep and slightly

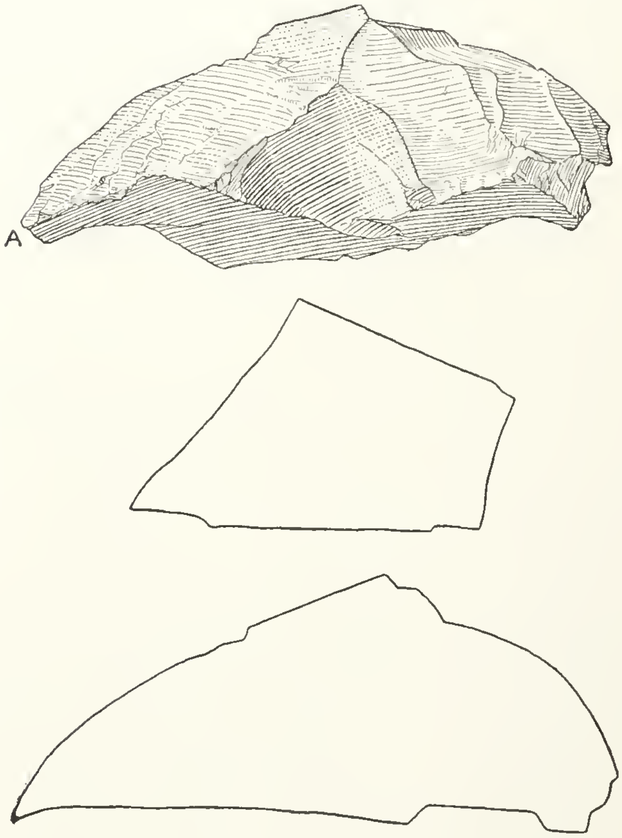

Fig. 10. Carinates and core scraper roughly prepared and utilized with longitudinal and cross profiles to show form. "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. (11.8 cm.)

concave scraping edge which shows wear from use. Such prepared edges are common on flakes and fragments of a wide variety of shapes.

INTERPRETATION OF THE COLLECTIONS

It seems obvious that Holmes was obsessed by the origin of the bifaces and neglected to analyze the irregular and flake tools. He admits the existence of broken and incipient implements and states that there are flakes and fragments that would make excellent knife blades, perforators, piercing tools, or weapons. ". . . many must have been utilized in the arts without modification."[11] From the standpoint of my collection these irregular shapes are so numerous as to be more characteristic than the bifaces. Not only are there many utilized flakes and rough blocks, but there are also roughly fabricated tools which show evidence of use. It is impossible to assume that these are the pick-up tools of the temporary camps of the quarrymen. Nor can we assume that these implements were used in quarrying. They are unsuitable in size and shape. It seems obvious that they were used in some other industry which required very large numbers of scraping and cutting edges. Presumably the manufacture of objects of wood and bone was carried on coincidentally with quarrying.

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[11] Holmes, 1894, p. 17.

THE ALIBATES QUARRY, TEXAS

THE Alibates Quarry lies 34 miles northwest of Amarillo, Texas, in the broken south slope of the Canadian River canyon. I visited it under the guidance of Floyd V. Studer, Director of Archaeology of the Panhandle Museum.

The quarry consists of a number of pits along the south rim of a flat-topped ridge, capped and supported by the flint bed. The flint occurs at the horizon of a dolomitic bed in the Permian "red beds" and is the result of the replacement of dolomite by chalcedony. It is therefore sometimes called a "silicified" or "chalcedonized" dolomite. Since the artifacts made from this flint center around Amarillo, the material is referred to as Amarillo flint, or even Amarillo dolomite. The location of the quarry 3 miles east of Alibates Creek and the Alibates ruin suggest that the name *Alibates*, chosen by Mr. Studer, is preferable.

The flint bed is about 6 feet thick and was not only mined on the outcrops but also in pits 10 to 12 feet in diameter. One of these pits has been excavated under Mr. Studer's direction. The flint is irregularly but minutely banded in shades of blue-gray or red, with or without bands of white or pearl gray. Some pieces have spots of white on a red background and irregularities in the banding. Although the excavated pit and the refuse suggest that blue is the dominant color, red seems to have been preferred and is the commonest in implements of this flint found at a distance. The peculiarities of the flint made distinctive although highly variable patterns which are easily recognizable so that flint objects found at a distance can be identified by persons familiar with the range in color and pattern of the Alibates flint. I am informed, however, that flint of this character was quarried at other sites in the Panhandle of Texas.[1]

The flint breaks on fairly regular vertical joints into blocks 2 to 12 inches (5 to 32 cm.) across and 6 to 12 inches (15 to 32 cm.) long. It appears to have been mined in these blocks. There were, however, many irregularities in the jointing, and the quarry waste contains highly irregular fragments, lumps, and flakes.

In this debris which covers several acres are many utilized flakes, fragments with prepared edges, and massive cores and bifaces. There is a marked resemblance to the utilized material from the "Spanish Diggings" of Oklahoma.

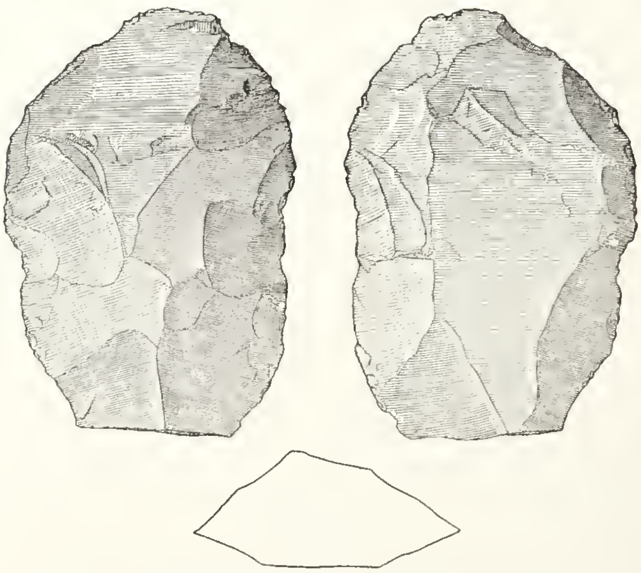

FIG. 11. Large biface or ax. Alibates Quarry Texas. Collected by Bryan, 1942. (14.9 cm.)

Large bifaces are common (fig. 11). A few like the one shown in figure 12 have a thin worked edge which would make an excellent gouge or scraper. It is similar to an artifact found in the excavation of the ruin 3 miles away on Alibates Creek.[2] J. Charles Kelley informed me orally that this scraper end on a block of flint which forms the handle is a common artifact in central Texas.

Utilized flakes are common and some are definitely formed rough scrapers which show use as the one shown in figure 13. The range in form is not, however, so great as at the "Spanish Diggings." The excavation of the ruin has yielded large numbers of thin bifaces,

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[1] Witte, 1942.

[2] Studer, 1934.

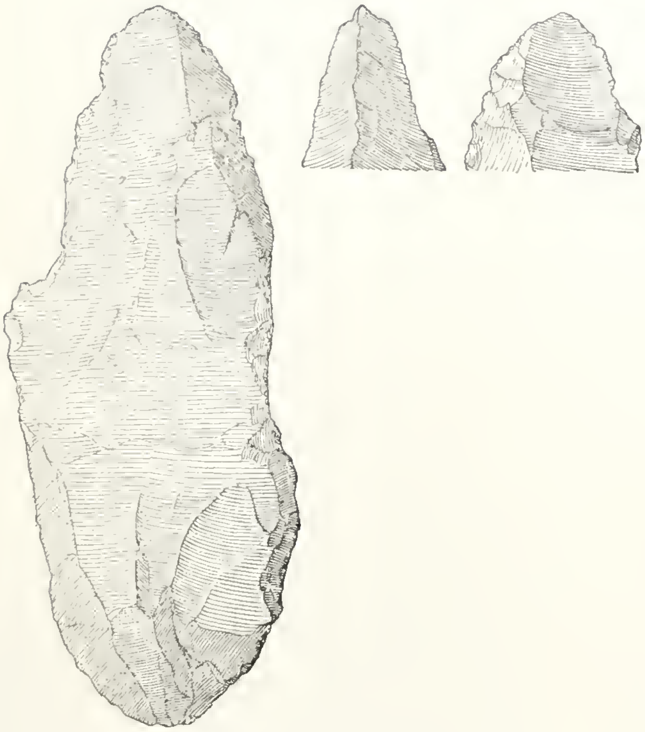

Fig. 12. Large biface with prepared scraper at one end. Alibates Quarry, Texas. Collected by Bryan, 1942. (17.5 cm.)

apparently used as knives and also many doubly beveled knives described in part by Poteet (1938). The debris at the ruin contains many flint chips and it seems evident that, as postulated by Holmes for all quarries, much of the finer work of making flint implements was done in and about the ruin. However, at the quarry the number of utilized flakes is far too large for them to be the tools used in the casual camps of people engaged in quarrying. As at the "Spanish Diggings" some other activity than quarrying must be inferred.

The antiquity of the quarry can at present only be judged by the distribution of its product. Much of the visible work was done during the occupation of the nearby ruin just before the Spanish Conquest.

A Folsom point made of Alibates flint as well as chips in various horizons were found at San Jon, New Mexico.[3] It appears, therefore, that the flint was used by the Palaeo-Indian. We have no evidence that these people quarried flint. They may have merely gathered it. All we can infer is that this flint was used over a long period and presumably active quarrying began before the ruin was built. How much was done in these earlier times and whether the early work can be distinguished from the later is not known. Much of the present surface debris and most of the well-marked pits are presumably the work of the later Indians.

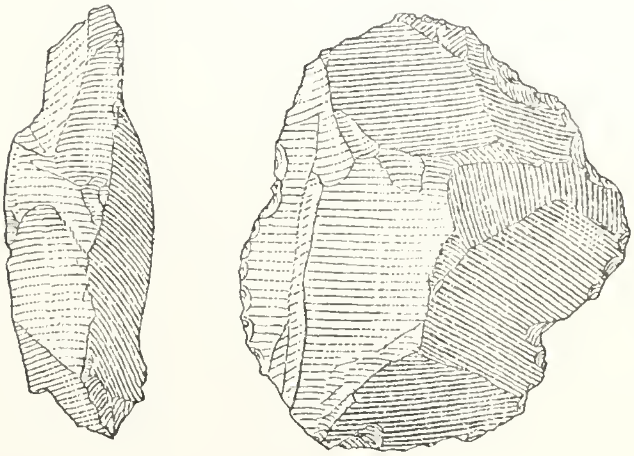

Fig. 13. Small rough and utilized scraper. Alibates Quarry, Texas. Collected by Bryan, 1942. (5 cm.)

[3] Roberts, 1942.

THE CERRO PEDERNAL QUARRY, NEW MEXICO

THE flint quarry of Cerro Pedernal has already been described.[1] Here a bed of flint 8 feet thick, part of a siliceous limestone 25 feet thick, belonging to the Abiquiu formation, crops out on the southwest flank of Cerro Pedernal at an altitude of about 8500

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[1] Bryan, 1939.

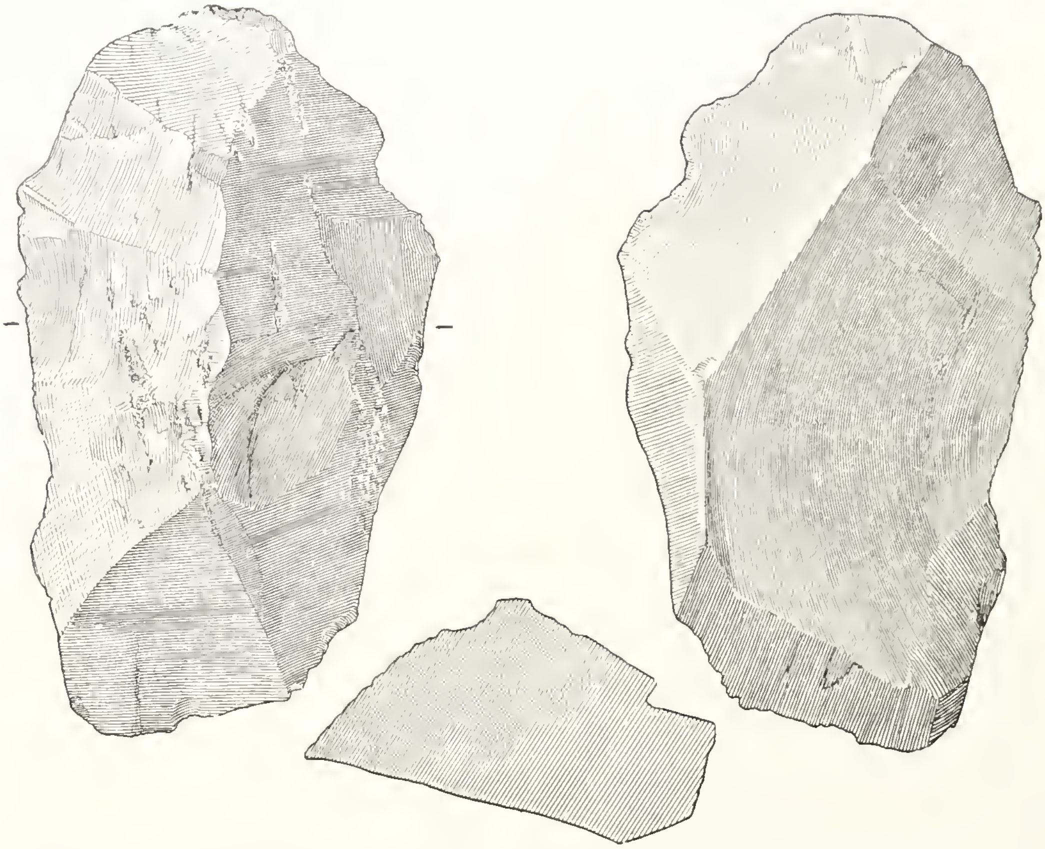

Fig. 14. Large biface or ax formed by breaking with deep scalloped flakes. Cerro Pedernal Quarry, New Mexico. Collected by Bryan, 1938. (15.0 cm.)

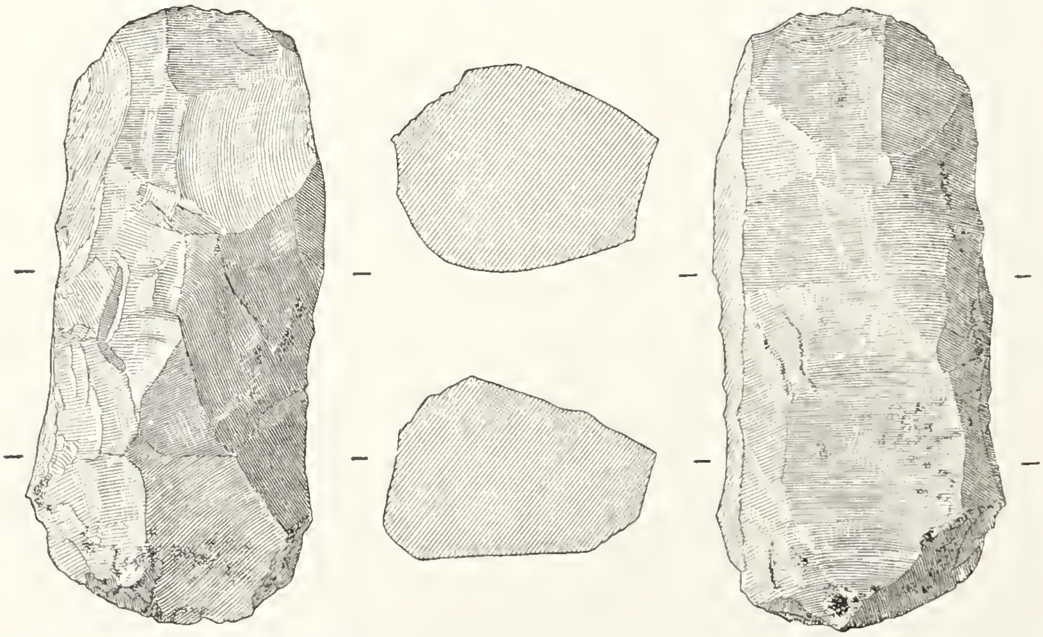

Fig. 15. Large biface or ax with rectangular cross section. Cerro Pedernal Quarry, New Mexico. Collected by Bryan, 1938. (13.2 cm.)

feet. This flint has been traced 20 miles westward to San Pedro Mountain where ancient quarries also exist.[2]

Excavation in the quarry refuse produced large bifaces 3½ to 6½ inches (9 to 16 cm.) in length (fig. 14), some of which were made by taking out deep scalloped chips and others with flatter flakes. Several were smaller, 5 to 5½ inches (13 to 14 cm.) with cross section rectangular or lozenge-shaped (fig. 15). All these forms appear to be axes.

The lozenge cross section goes with a pointed end. There are also the peculiar "twisted axes." In addition there are the flakes made from large bifaces by the Levallois (figs. 16 and 17) or Clactonian technique. Some of

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[2] Church and Hack, 1939.

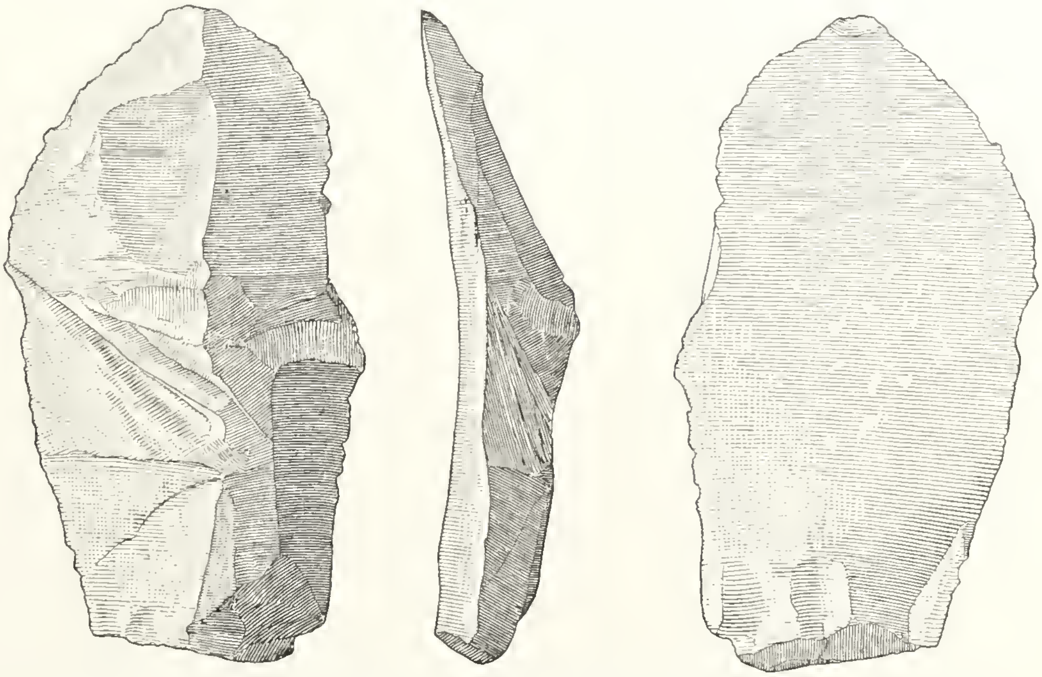

Fig. 16. Large flake struck from a biface with a prepared striking platform, Levallois technique. Cerro Pedernal Quarry, New Mexico. Collected by Bryan, 1938. (13.6 cm.)

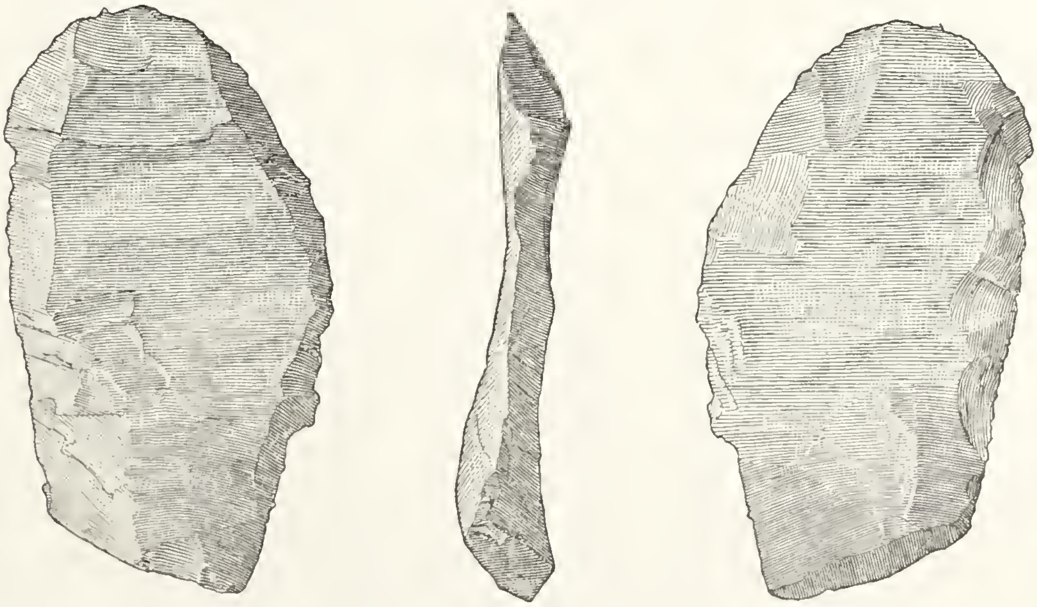

Fig. 17. Large flake struck from biface with unprepared striking platform. This is obviously at least the second flake struck from this core. Cerro Pedernal Quarry, New Mexico. Collected by Bryan, 1938. (11.2 cm.)

these flakes seem to have been reworked into end scrapers[3] and others were utilized without much change (fig. 20).

Large thin bifaces, small rounded bifaces, and various forms which might be considered "tortoise" cores are found.

The dominate types appear to be axes of various shapes many of which are broken by a simple break across the long axis. Such broken axes furnish ideal cores for the production of the Levallois- and Clactonian-type flakes.[4]

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[3] See p. 25.

[4] See p. 25.

COMPARISON OF THE THREE QUARRIES

IN ALL three quarries the large bifaces which Holmes called "blanks" are numerous. However, many of these show wear and others are broken, as if by use.[1] Heavy flakes struck from bifaces occur and some of these show wear, and in the Cerro Pedernal Quarry some were reworked into end scrapers.

There are differences. The bifaces at Cerro Pedernal are more specialized than at the other two quarries. Utilized flakes and the rough scrapers made on random blocks seem to be more common at the "Spanish Diggings." Trapezoidal cores and the flakes (blades) made from them are also more common. The small shaped scraper on the end of a large biface appears to be solely characteristic of the Alibates Quarry. The three sites have in common large quantities of utilized flakes and irregular fragments as well as heavy bifaces — the "blanks" of Holmes.

[1] See p. 22.

GEOGRAPHIC FACTORS IN MANUFACTURING

HOLMES' assumption that all the quarrying was for the production of an exportable type of flint object ignores the great mass of utilized flint fragments found in quarry debris. Further it ignores a general principle in industry. Hand tools and light or conveniently carried tools are taken to the job. If heavy tools or tedious processes are involved, the material to be worked is brought to the tool or to the labor supply. This alternate is in its essence the factory system. In our modern industrial system there are five main factors: (1) supply of raw material; (2) power; (3) fuel; (4) labor; and (5) market. In a modern economy no one of these factors is a single element. Many fabrications require more than one raw material and relative weights or ease of transportation of one or another of these materials may be decisive. Power and labor also are transportable under modern conditions, but at a cost. Whereas market may be regarded as immovable so far as any one enterprise is concerned, many manufactured products can stand the charges of transport to great distances. Thus under modern conditions of transportation Pennsylvania coal is moved to Cleveland and Chicago and there is used to make steel from iron ore mined in Minnesota with limestone mined in Michigan or elsewhere. In these manufacturing centers steel meets a market and can be transported to still wider markets. Similarly coal from West Virginia and gypsum from Nova Scotia are brought to Boston for manufacture of plaster, wallboard, etc. Here cheap water transport brings bulky raw material and fuel to a large labor supply and a market area.

In the somewhat more primitive economy existent before the steam engine, grist mills were usually actuated by water power. They could only be located at the few available power sites. Grain had to be carried to the mill and the flour or meal carried away. A windmill had a large latitude of location but suffered from discontinuous operation. The modern textile mill is located by reason of a compromise between the factors of power, raw material, and labor with the emphasis at present on cheap labor. As long as textiles were produced solely by hand methods, the tedious work of weaving was ordinarily performed near a habitation regardless of the source of the fiber; but spinning might be done in the intervals of other work or while traveling. The size of the loom and its portability are a factor in its use since the lighter looms are movable and characteristic of hunting and pastoral types. The heavier looms are characteristic of village peoples.

In both primitive and modern economies, the hand tool is carried for emergencies or recurrent tasks which must be performed at a time or place which cannot be anticipated. For the manufacture by primitives of articles of wood or bone on a large scale, large quantities of flint tools are required. For economy of effort it is necessary to balance the carrying of the raw material to the flint or the flint to the raw material or to some other working place. In our economy transportation has been cheapened by numerous inventions. To primitive man, especially the primitive with no beasts of burden except perhaps the dog, transportation is a serious matter. It would obviously be easier to transport wood or bone to the flint unless the objects manufactured were themselves so heavy as to be difficult to carry.

In North America nearly all Indian tribes had canoes or dugouts. Thus transportation by water was relatively easy. The "Spanish Diggings" are just above a creek which connects through Spring River with Neosho or Grand River, a tributary of the Arkansas. One could presume that flint and raw material could have been brought in or out by water but there are insufficient facts to establish this presumption. The manufacture of dugouts is a special case. Large boats of this type cannot be easily carried and therefore one would expect them to be made on a stream bank where launching would be easy. On the other hand, large quantities of flint must have been required. A flint quarry near a navigable creek would obviously be a preferred location.

If the quarry is also to be a factory the question of food supply must be considered. Obviously food must be provided during the time that quarrying is carried on. As provisions for only a limited time could have been carried on men's backs, some quarry sites must have been preferable to others because of good local supplies. A quarry in a region barren of resources in game or agriculture would be likely to have been worked for short intervals each year and have produced flint solely for export. Each trip to the quarry would have been a journey undertaken by specially selected men. It would have resembled the journeys of the Papago to the Gulf of Lower California for salt, or those of the Hopi to Zuñi Salt Lake.

A quarry site in a favorable hunting area like the "Spanish Diggings" or near fields like the Alibates site in the period of occupation of the nearby ruin could have been occupied for a longer time. As flint is heavy and wood and bone light, it is probable that fabrication of wood or bone and complete fabrication of flint implements would lead to economy in transportation. The quarry would be a factory during the period of occupation.

It must not be thought that the site was necessarily occupied throughout the year. Under a hunting economy only a limited number of people could reside for a limited time in any one place. Only with the introduction of agriculture was permanent residence possible. Custom, trade relations, and treaties may have entered into the question of permanence. It is said that the Hot Springs area of Arkansas was neutral ground. Men of all tribes came for baths in the healing hot waters. The local tribe held a privileged position and lived by quarrying novaculite and fabricating it into tools which were traded to visitors of outside tribes. To what extent quarrying was protected by laws or custom, or was a specialized occupation of certain tribes or of individuals within tribes is unknown for the quarries here considered. Heizer and Treganza (1944) discuss this question with much acumen and knowledge of California tribes. To the extent that such customs existed, it would have been easier for the quarries or their immediate environs to become factories.

From the foregoing analysis and in the light of the collections it appears that the sites of the three quarries here considered should be regarded as industrial establishments. As need arose individuals or groups of artisans gathered and quarried flint. In part the flint was fashioned into implements for export. There is little trace of the making of the smaller implements and of arrow heads, but surely flakes (blades) were made from which these smaller implements could be easily fabricated.

In addition materials such as wood, bone, or horn were brought to the site and in their fabrication the innumerable utilized flakes, blocks, scrapers, and other irregular forms were used and discarded. The quarry thus became an industrial establishment or factory.

THE HEAVY BIFACES

A VERY large number of bifaces, many of which were broken, have been found at all three sites. These bifaces are of two types: those which are thick, 1½ to 2 inches (4 to 5 cm.) and those which are thin, ½ to ¾ inches (1 to 2 cm.). Holmes' idea is that the thin bifaces or "blades" are the result of continued chipping of the thick bifaces. Most experimenters on chipping would hold that to make a thin blade, it is preferable practice to begin with a thin slab. In reducing a thick biface the central part tends to resist removal.

Aside from the presumption that Holmes' theory of the derivation of thin from thick bifaces is incorrect, there is the fact that, according to his own account and later experiences in collecting, many of the heavy bifaces are broken at right angles to the long axis as shown in figure 3. Such breaks cannot be easily attributed to manufacture but can be explained plausibly as due to use. If it is postulated that the bifaces were hafted and used as axes, such breaks would be characteristic. To be most effective the force of an ax stroke should lie precisely in the axis of the head. In a modern ax the head is almost perfectly symmetrical and the edge of the blade lies in the plane of symmetry. Furthermore the handle is not only held firmly in an oval eye but the handle is stiff and flattened so as to aid the hands in holding the ax true in the line of the stroke. If these bifaces were used as axes the presumption would be that they were hafted in a sapling either split or wrapped around the head and used with or without a wedge as shown in figure 18, *A*.

The strains in an ax are due to lack of balance in the forces operating as the ax comes in contact with the material to be cut. If the ax is used in splitting wood a strong blow may penetrate deep into the wood. Any lateral forces resulting from lack of balance in the ax head or in the hafting will be resisted by the pressure of the wood (fig. 18, *B*). If the penetration is not so deep the cutting edge or bit is held firmly and the lateral unbalance operates on the rest of the head. The resistance of the wood to lateral movement holds the bit firmly. The unbalanced force lies above, figure 18, *C*, and there is a tensional or even a shear strain in the ax just above the bit. In a metal ax this strain is seldom of consequence, since metal has a high resistance to tensional and shear stresses. The fine-grained igneous rocks such as basalt or diorite commonly used for polished stone axes also have relatively high tensile and shear strengths. Flint, however, has a low tensile and shear strength. In other words, it is brittle and breaks easily at right angles to the axis. Further these chipped axes are not so symmetrical, hence not so well-balanced as polished stone and metal axes and therefore subject to greater strain.

In the use of axes in cutting across the grain of wood, the unbalanced forces are more numerous and greater in amount. Only one stroke, the common one used for enlarging a scarf need be analysed (fig. 18, *D*). The unbalance of forces is marked and is a requisite for removing the chip. The unbalance can be so great as to twist a modern ax out of the hands of the user. With a biface hafted in a split sapling the axman must have had difficulty in controlling the blow. In either type of blow the break tends to be near one end of the ax. Broken bifaces which conform to the shape of broken axes are common in "Spanish Diggings" and also at Cerro Pedernal.

Modern experimenters like Léon Coutier can make a European chipped hand ax in a few seconds. J. D. M'Guire[1] pecked into shape and polished an ax of "black porphry" in five hours. According to Pond (1930) H. L. Skavlem made a polished celt from a pebble in seven hours, made another in two and one-half hours, and resharpened it in one and one-half hours. It seems, therefore, that the rough bifaced ax could be made very quickly compared to the polished ax. Where material was plentiful, as at a quarry, it would

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[1] M'Guire, 1891, p. 303 and pl. 1, fig. 2.

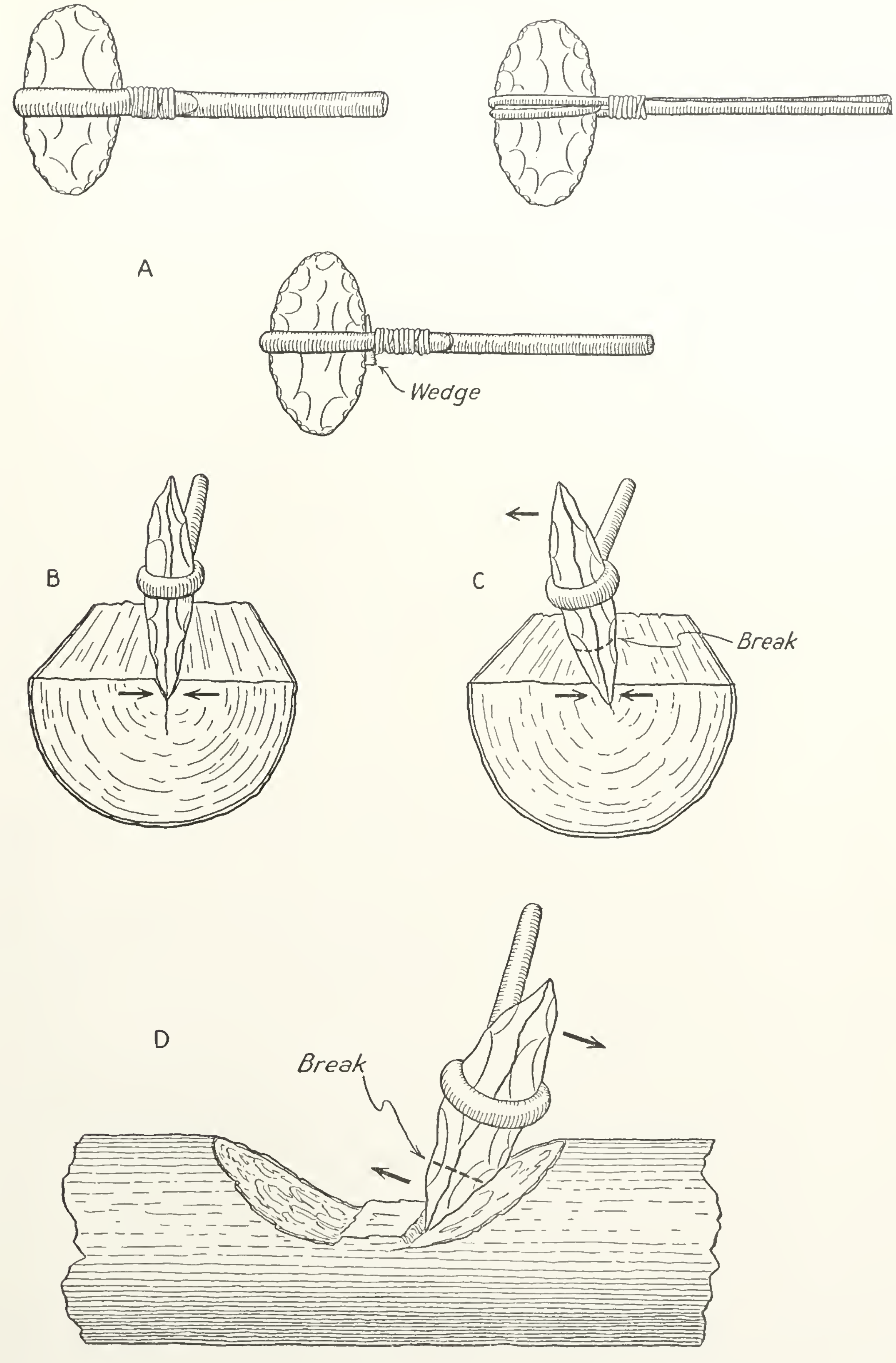

Fig. 18. Use of flint ax: *A*, Types of possible hafting in a sapling handle. *B*, Straight, well-balanced stroke in splitting wood, strain on ax negligible. *C*, Unbalanced stroke in splitting wood and position of potential break. *D*, Stroke for clearing scarf in cutting log always an unbalanced stroke, with position of potential break.

have been used and then with little hesitation discarded.

Furthermore if the flint ax after being broken has a supplemental use as a core, economy is even more marked. Holmes (1894) in his plate ix–c gives a drawing of a curved flake with a retouched and utilized edge that is apparently struck from a biface core. My collection from the same quarry also contains flakes made from bifaced cores, figures 5 and 6. The evidence that such flakes were regularly made and utilized is not complete in the Oklahoma and Texas quarries. At the Cerro Pedernal Quarry broken bifaces and flakes struck from them are fairly common, figures 16 and 17.

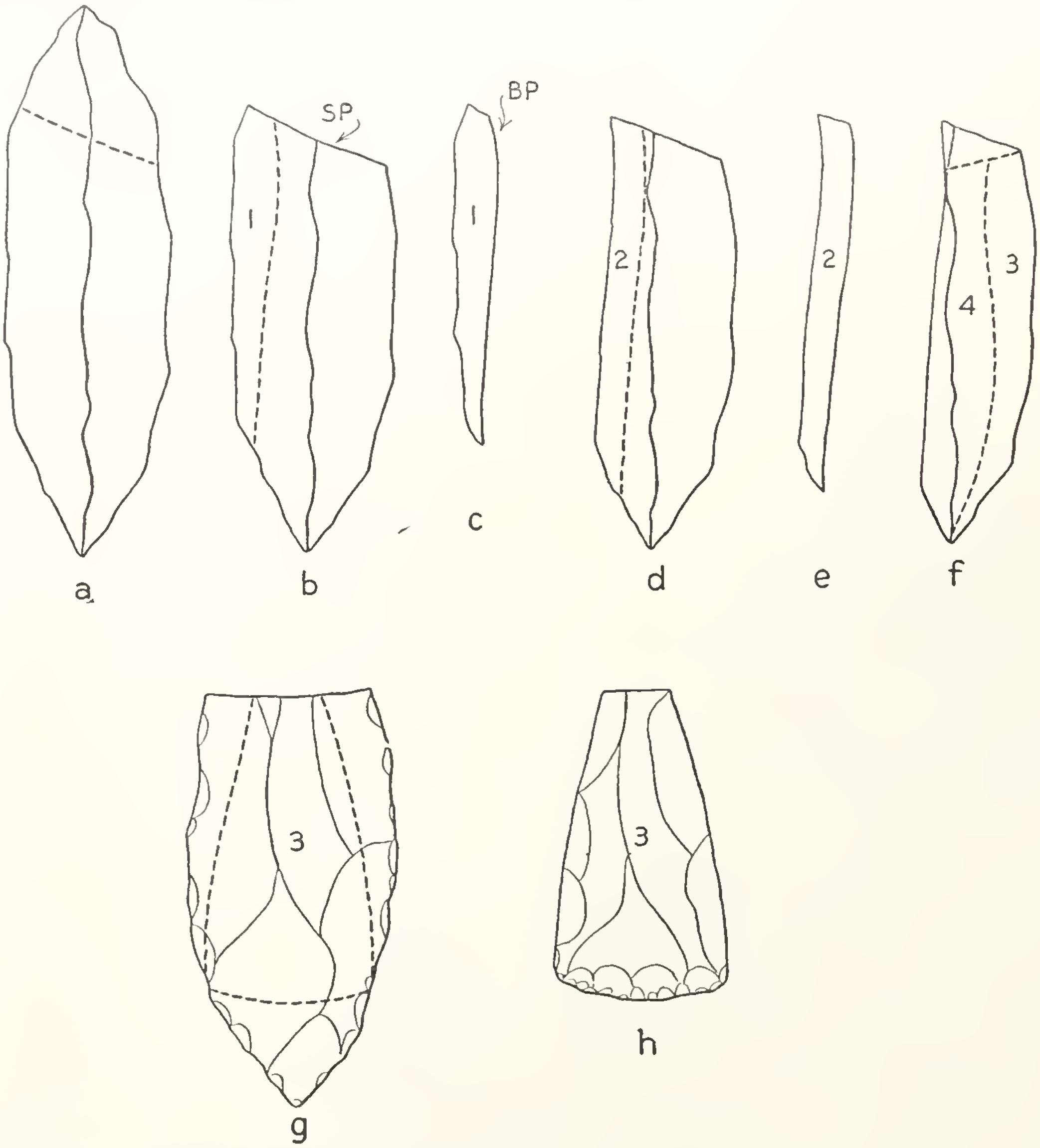

Fig. 19. Development of utilizable flakes from broken biface or ax: *A*, Biface seen from the side, dashed line shows position of break. *B*, Broken end becomes striking platform, dashed line is position of break. *C*, Clactonian-type flake (1). *D*, Dashed line is position of break in producing flake (2) shown in *E*. *F*, Broken line shows position of new striking platform and break to form Levallois-type flake (3) and residual mass (4). *G*, Flake produced by above methods, broken lines show position of potential end scraper. *H*, End scraper developed from flake.

The method is illustrated in figure 19 in which the biface (a) is shown with a potential break such as would result if it were used as an ax. If the break forms a good striking platform as shown in (b) then the first flake (1) can be struck off (c). Such flakes illustrated in figures 5, 6, and 16 can be utilized directly as scrapers or modified by retouch. The use of a break as a striking platform is characteristic of the Clactonian, one of the earliest stone cultures of England and France. To these relatively late quarrymen it was, however, only an alternate method. If the core is thick a second flake can be then made (d, 2). Such a flake (e) is illustrated in figure 17 and is easily modified into a scraper. In order to use the other side of the biface, it would be necessary to modify the top of the core. If a new striking platform is formed by successive flaking, flake 3 can be struck (f, 3). This flake conforms to the definition of Levallois technique as it is struck from a biface core provided with a prepared striking platform. This also is a European Palaeolithic technique utilized by a more modern people. The common use of "Clactonian" and "Levallois" as the names of techniques in flint-working is here continued under protest. Kelley (1937) has shown that Acheulean flakes also exist. They have both prepared and unprepared striking platforms and much flatter bulbs of percussion than typical Clactonian or Levallois flakes. Paterson (1937) has described from Barnham St. Gregory in England near Cambridge a sequence of four industries with a transition in angle of striking platform and curvature of the bulb of percussion. It is obvious that our knowledge of European flake cultures is expanding and that their supposed rigidity in form and therefore conservatism in technique is largely illusory. The use of Clactonian, Levallois, and Acheulean in the description of flake forms should be restricted and new terms, without connotations as to time and culture, should be introduced. Furthermore, I am uncertain that all Clactonian, Levallois, and Acheulean flakes were struck from bifaces. In 1948 Mr. Harper Kelley showed me two cores of Acheulean date from which flakes had been struck and presumably still could be struck. It is also uncertain just how the flakes were struck. That some were made by striking the core against an anvil seems probable, but others seem to have too flat a bulb of percussion. So far as observed, the flakes in American quarries, obviously much later in date than European Palaeolithic flakes, have flat bulbs of percussion and were presumably struck off by hammer blows. However, many of the "tortoise cores" have deep flake scars, and they may have been subjected to the anvil technique.

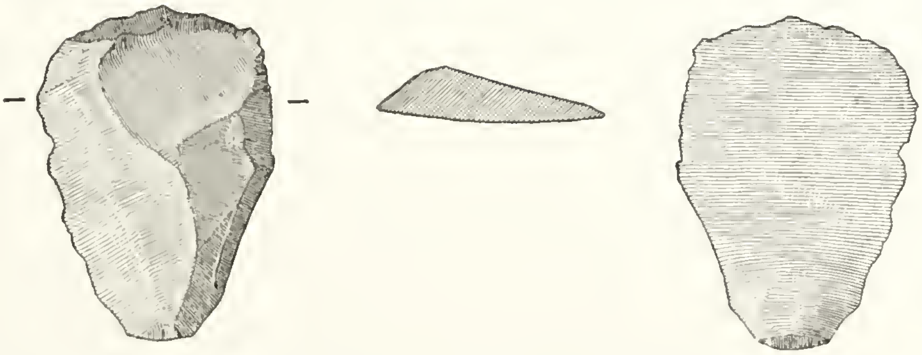

FIG. 20. End scraper developed from a Levallois-type flake. Shows slight indications of use but is doubtless a "reject" as it is overthin. Cerro Pedernal Quarry, New Mexico. (7.1 cm.)

The remaining core (fig. 19, f, 4) would have a flat face on both sides and could doubtless be utilized, but my collections do not contain shapes which can be attributed to these residuums of a process otherwise well illustrated.

The further development of flakes of both Clactonian and Levallois technique is illustrated in figure 19, g and h, where the flake is shown as converted into an end scraper. The artifact from Cerro Pedernal shown in figure 20 is an end scraper developed in this fashion from a flake which was of the Levallois type as shown by the remnant of the striking platform. It is unused or at least not much used and was apparently a true "reject," doubtless because it was overthin.

OTHER TYPES OF QUARRY SITES

IN THE economy of modern man quarrying and mining is regarded as an "extractive" industry located at the source of material and yielding a product to be transferred to the place of use or reduction. "Reduction" or the transformation of the mined product into a more usable but still raw form is usually accomplished at a distance, in some instances many miles, from the mine or quarry. This relation exists because transportation has become easier and cheaper with each generation.

Arkansas novaculite is even yet the best natural "oil stone" for sharpening knives. Two men in six weeks quarry novaculite blocks which are shipped to Vermont for sawing and finishing. A single railroad car carries enough material to supply the world for a year. Obviously the cost of "reduction" and distribution vastly exceeds the cost of the raw product.

It is difficult in considering quarrying by primitives to realize how laborious and time consuming transportation would be in the absence of animal or mechanical means of transport. Under such circumstances only materials of considerable value would be moved long distances.

Furthermore, the quarry site can be occupied only by moving in food to the quarrymen. Nearby game would be soon exhausted and one must assume that quarrying was largely a discontinuous and seasonal occupation.

The assumption made by Holmes that a quarry existed solely for the production of a mineral product reflects his knowledge of modern quarrying and mining. It is applicable only to special types of primitive quarries. Thus Holmes' interpretation of his excavations at a soapstone quarry in the District of Columbia seems reasonable.[1] He holds that soapstone bowls and dishes were merely roughed out at the quarry. They were carried away as blanks to undergo the laborious work of finishing at a habitation. This interpretation is supported by the character of the debris and by finds of unfinished bowls ("blanks") at nearby village sites. It is also compatible with the economy of the partly agricultural local Indians. They occupied the quarry sites to which food must have been carried on men's backs for as short a period as possible. The time-consuming task of finishing the bowls was performed in the intervals of other activities at village sites. Such interpretation is supported by Holmes' investigation of a soapstone quarry in California (1902). Also, Holmes' assumption that the tools found in the soapstone quarry were used solely in quarry operations seems reasonable, and the types of tools are paralleled in California. Bullen's studies in Massachusetts (1940) and Heizer and Treganza's (1944) comments support Holmes on soapstone quarries.

However, complete finishing of soapstone bowls and ornaments at the quarry is indicated by the excavation of the Wilbraham, Massachusetts, quarry refuse by Howes (1944). Glacial boulders of soapstone were dug out and quarried in the usual manner by roughing out bowls while they were still attached to the matrix. In the quarry debris were found a portion of a small bowl and shallow dish, both completed or nearly completed, and a partly finished spoon, indicating to Howes that finished work was done at the quarry site. His excavations prove also that the smaller masses of soapstone not usable for pots and platters were worked into pipes, pendants, spoons, and other small objects. Further excavations at this site would be profitable in furnishing additional evidence that manufacture was largely completed at the quarry site. Unfortunately the archaeological horizons of Massachusetts are incompletely known and the period of occupation of the Wilbraham quarry cannot be surely determined. When, however, this dating is complete, it will be possible to infer the reasons which lead the quarrymen to finish articles at the quarry. Doubtless there were circumstances sufficiently different from those in the vicinity of Washington where Holmes seems to have established that finishing was done in the villages.

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[1] Holmes, 1890b.

A recent study by Jury (1949) of a quarry and chipping site of the Attawandrian or Neutral Nation near Port Franks in Ontario brings out some of these complex relations. The flint source is a small anticline of Devonian beds which brings to the surface the cherty horizon of the Ipperwash (Hamilton) limestone. The chert forms a "reef" or "Stony Point" projecting into Lake Huron. The chipping sites are 2 miles distant on present and ancient channels of the Ausable River so that there was water transport by canoe between them. Near the outcrop was found a crushing site near an old tree stump at which chert fragments or slabs 12 to 18 inches in length and several inches thick surrounded granite blocks 10 to 12 inches in diameter. By experiment, Jury showed that a lever 24 feet long held under the roots of a large tree and brought down by four men on a large flint-block laid on one of the granite blocks would crush the flint into slabs of the appropriate size and shape. The air-dried flint pieces found on the beach would shatter into small pieces. Only wet blocks picked under water from the "reef" or "Stony Point" would produce the appropriate sizes. At the chipping floors, 2 miles away, the largest pieces were these prepared slabs from which were fabricated all other flint tools.

The Attawandrian Indians supplied the surrounding hostile Iroquois, Huron, and Algonquins with flint arrow heads. Their territory was neutral ground and they maintained their monopoly of the only source of flint until they were destroyed by the Iroquois in 1650. Their main settlements were several miles away from the chipping floors, but there was water transport by canoe for part of the distance. The work parties at the chipping floors were provided with huts for shelter and presumably lived at these sites for considerable periods each year. The complicated procedure of crushing near the outcrop, transferring the slabs to the chipping floors, and the transfer of the final product to the main villages is supported by Jury's data. Whether the chipping floors were factories for the manufacture of wood and bone objects is not brought out. It is obvious, however, that further excavation in the area of the Neutrals and of their neighbors will produce additional data on these activities and on the numerous inter-relations of the tribes involved.

Heizer and Treganza (1944) show that the Indians of California quarried mineral products of many types for the following uses: (1) sharp tools: mostly fine-grained siliceous rocks, "flint," and obsidian; (2) grinding tools and hammers: sandstone, metamorphic and igneous rocks; (3) building and industrial materials: clay, sandstone, soapstone, and asphaltum; (4) pigments and ornaments; (5) food, i.e., salt. Many of these products had a high value and quarrying at a distance with transport of the product to a distance was feasible. Further, the by-products of quarrying were useless.

Thus the turquoise mines of the Mojave Sink region of California were worked by Pueblo Indians from New Mexico and Arizona.[2] In three localities a total of 270 pits were counted by Rogers representing a vast amount of work to be executed by work parties operating at a distance of 200 or 500 miles from home. Heizer and Treganza (1944) give much historic data on long journeys made by various tribes to obtain mineral products by trade or by their own quarrying.

Hack (1942) shows that the coal mines in the Jeddito Valley, Arizona, were operated over a period of three hundred years for domestic heating and industrial use. About 10 per cent of the total coal mined was used in firing pottery. The firing places are located within a few feet of the mining face. Thus these mines were also an industrial establishment. The clay vessels, presumably prepared for firing at the pueblo or at some other place where water and clay could be brought together were transported to the fuel supply to save carrying coal up hill to the village. Furthermore, the smoke and ashes of firing were in this manner kept at a distance from the pueblo.

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[2] Rogers, 1929.

Ocher, copper, turquoise, and pipestone quarries or mines presumably existed merely as sources of a raw or semi-finished product to be refined or fashioned elsewhere. There may also have been flint quarries so located that it was simpler and more economical of time to move the flint to a workshop and there fashion wooden and other implements. The flint quarries here considered being located in places habitable by the Indians for considerable intervals of the year were not only sources of flint, but also industrial establishments or factories.

The same generalizations would apply to quarries in which quartzite and other rocks suitable for making chipped implements were obtained. It is to be expected that they would apply to the recently located quarries of glassy hypersthene andesite (latite) so widely used in the Taos Plateau of New Mexico.[3] How widely distributed industrialization at "flint" quarries may have been awaits modern detailed studies of quarry refuse at many sites.

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[3] Bryan and Butler, 1940.

CACHES AS EVIDENCE OF THE NATURE OF FLINT QUARRIES

GROUPS of flint objects are found buried at depths of a few inches to 2 feet in all parts of the United States. In the United States, these finds are called "caches," a name that in itself implies the common interpretation that these flint objects were buried by their owners with the intent of later recovery. The same implication attaches to the equivalent European term "hoard."

Holmes used the evidence of caches to support his ideas on quarries in two inter-related ways: (1) that the flint objects were "blanks" and not actual tools; (2) that burial was intended not for concealment but to retain the "quarry water" and, therefore, ease in working.

It is well recognized that many building stones are readily split and reduced to usable dimensions when first quarried. After exposure of two or three months they harden and become refractory. There appears to be some evidence that certain flints are more tractable when freshly quarried.[1] Whether burial will prevent loss of this quality is, however, an assumption made by Holmes which he did not prove by citation of evidence or by experiment. This tractability of freshly quarried flint and other siliceous works can be used as an argument against Holmes' theory on "blanks." In so far as flint is more easily worked immediately after quarrying, it would be advantageous to finish implements at the quarry. The making of "blanks" and the finishing of the implement at a later time would lead to the hazard of loss of tractability. One would expect the immediate use of "fresh" flint.

As many American Indians and apparently also many of the Palaeo-Indians appear to have made implements from selected stream pebbles, it is apparent that they were able to work many types of stone without regard to "quarry water." Caches are subject to a variety of interpretations. The only sure inference that can be made regarding all caches is that the person or persons who made them failed to recover property of presumable value. The motives of the cache makers are less safely inferred. Thus a cache in a village site may be considered as hidden by the owner for safety against loss or, as Holmes inferred, to preserve "quarry water." However, many caches have been found at points some distance from villages. They may have been either the tools of traveling families, the implements fashioned at a quarry by a work party, or the stock of a trader. The possibilities are numerous and the interpretation of single caches is correspondingly difficult.

If all the flint objects are worn by use, it may be that they are merely the tools of travelers. If, however, they are largely unworn, are uniform in material, and the material was derived from a distant source, it is a fair inference that the cache was made by a work party returning home or by a traveling trader.

These alternate inferences can be made more sure if a series of caches be considered. Thus the cache found about 2 feet below the surface in eastern New Mexico in 1941 consists of forty-four flint objects made of gray flint.[2] This flint is characteristic of the Cretaceous beds of Texas whose nearest outcrop is 200 miles southeast. There is no nearby source of similar flint, so that it must have been transported at least the distance to the nearest outcrop.

It was found by the geologist of Roberts' party, Sheldon Judson, about 2 feet below the surface in the late or No. 3 alluvial fill and is, therefore, not earlier than the late 1300's. The find consists of forty-four pieces including five large thin bifaces (hoes), end scrapers, side scrapers, and flake knives. Roberts has seen bifaces and scrapers of this flint from Lipscomb Co., Texas, and Ellis Co., Oklahoma, and they are also known from southern Kansas where the bifaces are known as the "Quivira Blade." Such bifaces are, however, generally regarded as hoes, but Roberts believes that they could be used as hide scrapers. Also, he holds that these tools were actually used.

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[1] Ellis, 1940.

[2] Roberts, 1942.

About 1932, Foley Griggs found a cache of similar gray flint on his ranch about 6 miles from the cache of 1941. It was buried under a rock on a hill slope in a canyon descending from the escarpment of the High Plains. There were fourteen objects of gray flint of which seven are now in the Laboratory of Anthropology in Santa Fe. These latter consist of five bifaces and two nodules. The bifaces are elongate rough knives or perhaps scrapers. At least one large ovate biface similar to the "hoes" of the cache described by Roberts is in the hands of a local collector. The worked flints of this cache, of which four are shown in figure 21, *c*, are all rough and might justifiably be considered "blanks." Further, the two nodules of flint, one of which is shown in figure 21, *c*, have been flaked just enough to show the clear gray flint underlying the surface crust, as if to give a buyer an idea of the value. The association of worked and unworked flints in this cache leads to the inference that this cache was buried by a trader or a work party.

The flint of these caches appears to be the gray flint occurring in nodules in the Cretaceous rocks of Texas. Witte has described two caches of similar flint. The four make an incomplete series as shown in the table below:

Obviously, interpretation awaits a more complete knowledge of the localities where nodules were quarried in Texas and a more complete series of caches. At the same time a knowledge of the quarries of variegated flint or silicified dolomite, at Alibates, and in Palo Duro Canyon[3] must be tied into caches of which Witte has already found two. That the gray flint from areas so many miles farther east and southeast in Texas should be found in New Mexico is remarkable. Obviously, some complicated factor or factors have affected the situation so that the gray flint has crossed the area naturally tributary to the Alibates and Palo Duro flints.

CACHES OF CRETACEOUS FLINT

Name	*Location*	*Rock of Finding Place*	*Presumed Minimum Distance of Travel*	*No. of Pieces*	*Weight in lbs.*	*Remarks*
Whitzitt	Jack Co., Tex.	Pennsylvania	40	24	6	Includes 4 pieces of brown flint
Johnson	Clay Co., Tex.	Pennsylvania	40	30	9	
Judson	Quay Co., N. M.	Late alluvium over Triassic	200	44	—	
Griggs	Quay Co., N. M.	Triassic	200	14	—	

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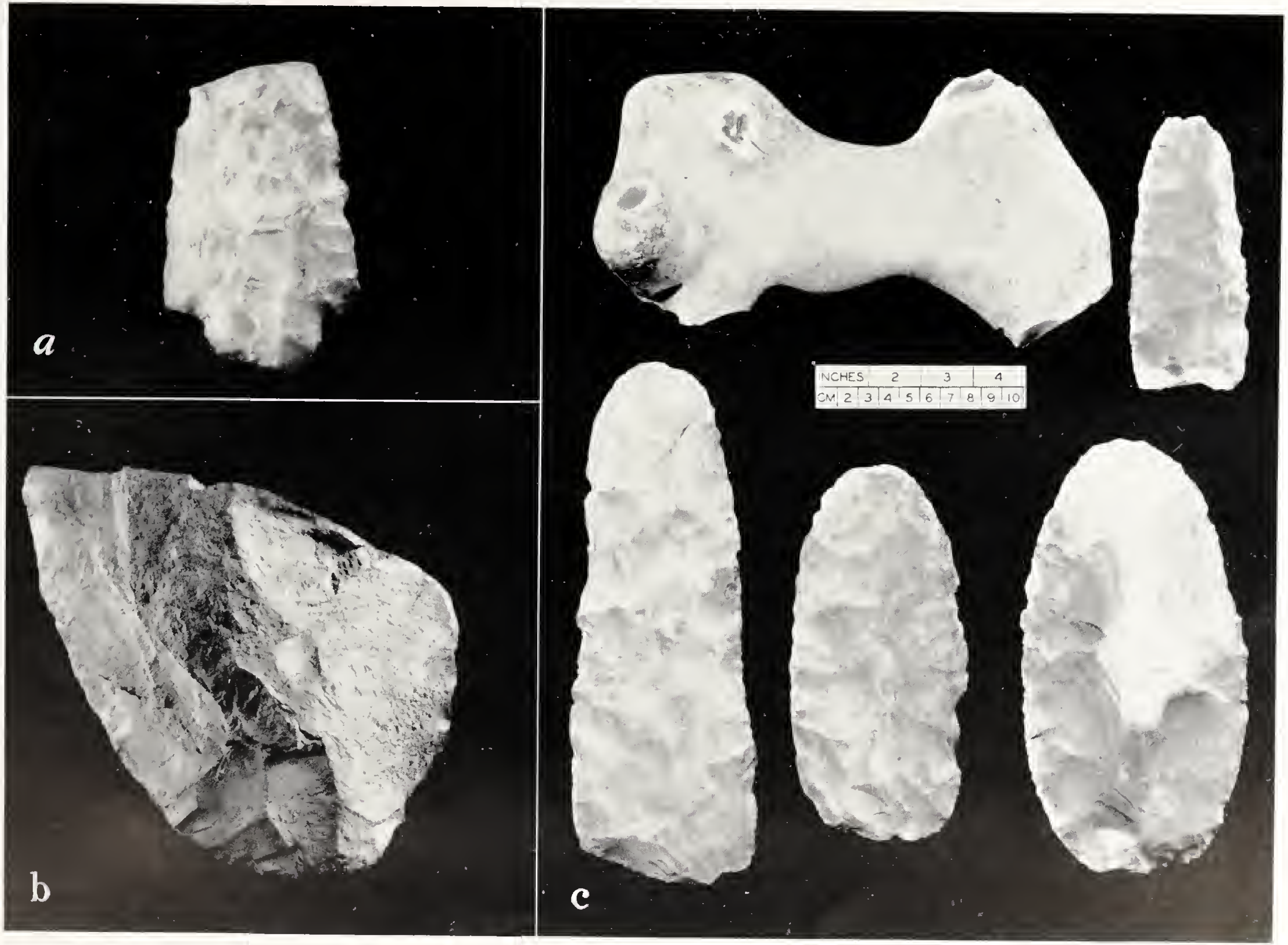
[3] Witte, 1942.



a, Arrow head with broken point from "Spanish Diggings" (Peoria) Quarry, Oklahoma. Collected by Bryan, 1942. *b*, Broken and presumably rejected "hoe" from "Spanish Diggings," Oklahoma. Collected by Bryan, 1942. *c*, Gray flint objects of the Foley Griggs Cache, found near San Jon, New Mexico. Photography by Laboratory of Anthropology, Inc., Santa Fe, New Mexico. Laboratory nos. 30/1156, 30/1157, 30/1035, 30/1036, 30/1152. (Height of *a*, 4 cm.; diameter of *b*, 15.5 cm.)

INVESTIGATION OF FLINT QUARRIES

THE flint quarry as a phenomenon of aboriginal life in America seems worthy of further investigation. The study here presented is by no means complete and merely foreshadows the possible results of more thorough and integrated investigations. The earlier studies were handicapped by reason of erroneous presuppositions, some of which have been outlined herewith. A newer and fresher outlook seems necessary.

Areal surveys such as the study of all the aboriginal mines and quarries of California by Heizer and Treganza (1944) provide a new start. One can approve wholeheartedly of the objective attitude of these archaeologists and of their scholarly search through the literature for pertinent information. Such a survey should stimulate efforts to learn more about the influence of mineral products in the economy and on the thought of California tribes in the period just previous to contact with Europeans. Still more important is further work by archaeologists who may also be stimulated to ascertain the facts as to the use of mineral products at each time horizon of the past. Armed with sufficient facts, they may also assess the cultural role of mineral products.

On theory we may assume that the advance of man in knowledge and in social organization was accompanied by increased use of mineral products. Nothing is more obvious in our own culture than the yearly increase in quantity and variety of mineral products with the advance of the European or modern civilization. That this dependence of civilization on mineral products is vital is embodied in the terms Bronze Age and Iron Age. But these terms have been so long in use that the original idea behind them has been blurred by the overlay of a multitude of facts about the people of these times and by the use of the terms largely in a chronologic rather than a cultural sense.

The use of mineral products by people in a "Neolithic" stage such as the North American Indian at the time of contact is greater than one would at first suspect, but the quantities involved are generally small. Chipped tools were, however, used in large quantities. Furthermore tools of this type have their beginning with the earliest known men. Thus flint, including under this term all varieties of suitable rock, has been worked from the earliest known beginnings of man. The technique of breaking flint, of gathering or quarrying flint, and the typology of flint tools are basic to an understanding of the earliest archaeological stages.

One can view the primitive flintworker as hidebound by ignorance and custom so that he knew only one or two types of implement and only one method of quarrying and reducing flint. Or one can view him as a casual and aimless brute who broke out rough masses, reduced them by careless blows, and utilized the resulting haphazard fragments. Presumably, he conformed to neither of these definitions, but was an intelligent and skilled workman trained from early youth in an art necessary to survival. He followed a system of work, all good artisans do. This system was an orderly procedure in breaking out suitable masses and in reducing these masses to the form required by his needs. However, each type of flint had a character of its own and the greatest economy of effort required a procedure adapted to the flint. Further, in the procedure there must have been, as there are today in all forms of processing, recurrent errors either in the accuracy of the blow or in judgment as to its location. What was done with these "mistakes"? Did each become a "reject"? One would expect that an intelligent flintworker would rework the product of these recurrent "mistakes." There would also be recurrent and haphazard defects in the material. Is the undesired form due to these defects also to become a "reject"?

The view that the flintworkers knew only one procedure and followed that method exclusively in the fashioning of a single, or at most two or three, implements is a current doctrine in the study of the European Palaeolithic, although this view is breaking down. It is supposed that these people were too primitive to be eclectic in method. One is tempted to believe this doctrine because of the relative uniformity of implement types or, at least, the uniformity of those which have been gathered in museums. Further, uniformity in color, texture, and workability is characteristic of the Cretaceous (chalk) flints used in England and France. This relatively tractable material occurring in nodules obtainable in more or less uniform sizes made systematic procedure in its reduction to implements easy. It is, therefore, supposed that early man dug out or picked up the flint nodules of the Cretaceous chalk of these countries. He then reduced these more or less uniform nodules by a series of consecutive blows, each directed to a predestined end. The final product of each step thereto is thought to have been foreseen. This rigidity of procedure is supposed to have lasted for thousands of years. It is then succeeded by a different but similar procedure resulting in another final product.

One can, however, note a tendency to break away from this set of concepts and to recognize that from area to area the forms of Palaeolithic tools are only approximately the same, that the time spans are not uniform, and that different materials induce somewhat different techniques. Comment has already been made on the work of Kelley (1937) in this new development in Palaeolithic study.

In a sense Holmes' concept of the development of a thin "blade" from a thick ovate biface was a similar idea. He carried his concept very far in deriving all other tools including arrow heads from the thin "blade." It is pleasant to believe in the fixity of primitive custom and it gives satisfaction to have invented a complete sequence of process. Faced with the obsidian blades struck systematically from original trapezoidal and final spindle-shaped cores, with end and keel scrapers struck from biface cores, which he found in the Mexican obsidian mines, Holmes acknowledged that they did not fit his theory; but he did not abandon the theory.

Stoneworking in North America has a history relatively short in comparison with that of Europe. Our oldest dated stone industry is the Sandia which has been placed in the early part of the cold period of the last glacial climax or just before 25,000± years ago.[1] It is comparable in time to the late Palaeolithic (Magdalenian of Würm III) and has many techniques in common with the Mesolithic of Europe. Our large quarries were operated in a time very much less remote and presumably just before the introduction of European steel tools. The people who operated them had a complete Neolithic culture. It is folly to believe either that they were completely hidebound by custom or that their work was aimless. They were, on the contrary, eclectic as to method and capable of change from one system to another according to circumstances. Over the vast reaches of the continent there were many areas without good flint. A miscellany of stones were used in many localities. Many of these stones had coarse textures and numerous pre-existing and potential fracture planes. Good workmanship and systematic procedure were difficult. Each blow produced a somewhat unexpected result and required a change in method or even in plan. The resulting implements were often crude and highly variable in shape. These difficulties with poor material were encountered by the Neolithic peoples of Scotland; and the tools produced, as illustrated by Lacaille (1939), are reminiscent of many American collections.

The great quarries of America were, however, opened in fine-grained siliceous rocks, cherts, novaculite, quartzite, etc., or in obsidian, from which large blocks could be obtained. These blocks had at each quarry roughly similar shapes or range in shapes and could be attacked more or less systematically. The quartzite boulders of the Piney Branch Quarry studied by Holmes were also of a general dominant shape and size. The flint nodules of the Cretaceous of Texas are like those of Europe largely free from hidden defects which make the chert nodules of the Palaeozoic rocks of the Middle West more dubious sources of workable material. The Cretaceous flint of Texas is so easily worked that there is little excuse for poor workmanship. Its quality has influenced development of the flint tools of this area which bid fair to exceed in variety those of any other part of the continent.

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[1] Bryan, 1941; Hibben, 1941.

In the study of the great flint quarries one should expect to find large quantities of waste rock. Part of this should consist of rock, clay, and sand which was removed in reaching the desired material. Part should consist of the desired rock which was imperfect or of poor quality. Part should consist of fragments of the desired rock too small for use or accidentally buried during the progress of quarrying. There should also be found stone implements used in quarrying. Under favorable circumstances there would be preserved implements of wood and bone such as have been described recently by Heizer and Treganza (1944). Waste rock and tools are characteristic of all forms of quarrying and may give little information as to the importance of the quarry or the type of people who did the work.

The quarry refuse may, as in the quarries here described, contain many fragments of random shape produced in quarrying whose edges and corners show wear from use. The random shapes may also be slightly modified by chipping so as to improve their edges as tools. The somewhat more systematically shaped flakes produced in the manufacture of tools may also be modified for use. These phenomena indicate that work was done on materials other than stone and presumably on wood or bone. One can conclude, therefore, that the quarry was a factory as heretofore argued at length.

The prime problem yet remains: what stone implements were made? Presumably the makers carried off the useful implements and left only those imperfectly made or broken in the making. Therefore, "rejects," as postulated by Holmes, should be found; but many objects which would seem from their shapes to be "rejects" show evidence of use. One must suppose that the defects of the material were known and that the stages in the process of fashioning at which defects would appear or breaks would occur were also known. Many of these defective pieces were not immediately rejected, but were slightly modified and used. The bifaced rough ax appears to have been made and used. Its breakage produced just the kind of bifaced core suitable for making scrapers. We must suppose that other broken tools, possible "rejects," were reworked into something useful. That these stages have not as yet been detected and systematized is presumably due to lack of study.

We should, therefore, expect that more detailed archaeological work in the debris of flint quarries would yield data adequate for the recapitulation of the technical sequences of flintworking. Each major implement was presumably begun in a way leading to economy of labor either in reduction of strokes or in the value of by-products and of the imperfect transitional stages. We should expect the sequences to merge into each other and to bifurcate, so that there may not necessarily be a single way to begin nor a single way to finish from one beginning. This type of analysis still awaits the patient and fortunate typologist.

In the meantime it is to be expected that the debris of a quarry opened for flint or other fine-grained rock suitable for chipped implements may contain the following categories of material:

1. Waste rock
   a) fragments and masses of rock, clay, sand, etc., removed in reaching the desired rock.
   b) fragments and masses of the desired rock of poor quality.
   c) fragments of rock of good quality produced in quarrying and unutilized.
2. Implements used in quarrying
   a) bone and wood.
   b) hammer stones and picks brought in from outside sources.
   c) hammers and picks made from the quarry rock. Such hammers are apparently rare.
3. Fragments of rock of good quality — utilized
   a) edges or corners produced in quarrying, utilized and the fragment discarded.
   b) edges or corners trimmed or sharpened and utilized and the fragment discarded.
4. Implements roughly shaped and utilized (axes, scrapers, etc.)
5. Flakes produced by Clactonion or Levallois technique from bifaces previously used as axes
   a) utilized as scrapers and discarded.
   b) formed into end scrapers and rejected.
6. Cores resulting from systematic production of flakes
7. Flakes systematically produced and utilized
8. Implements shaped or partially shaped and rejected as failures, true "rejects"

SUPPLEMENTAL STUDIES

OBVIOUSLY flint objects, being readily preserved, afford an opportunity for the study of their movement from the source into the surrounding hinterland. It is a necessary prerequisite, however, that the material be easily and surely identifiable. With this proviso the distribution of many types of flint have been studied. However, the lack of good archaeological sequences has made many of these studies slightly synthetic as it is necessary to assume that the spread of the flint took place in a single more or less continuous time period. With attainment of more numerous and precise archaeological chronologies many of these older studies of the movement of flint can be remade on a more precise basis.

The difficult task of differentiating between movement of flint objects by trade or by actual movement of the users or by special work parties who quarried at a distance from the homeland then arises. The use of caches as a means of studying these problems has been discussed. Doubtless, defeat awaits us in the attempt to solve many of these problems, but the rewards of success are high.

With a sound knowledge of the implements, particularly the larger implements used by people at different times and the typological studies of quarry refuse here advocated, it will be possible to make estimates of the amount of quarrying carried on at any one time horizon as Hack has done for coal mining in the Jeddito area.

To the extent that a quarry was also a factory for the fabrication of objects of wood and bone, its importance in primitive economy bulks large. Its location with respect to hunting grounds and agricultural lands and therefore the distances of travel necessary for the use of the factory become legitimate objects of study. One must suppose that a very considerable division of labor was attained and confirmatory lines of evidence assume a high value.

That differentiation of function was attained among the historic tribes of California is held by Heizer and Treganza (1944). They state that the Pomo recognized flint drill makers, shell wampum drillers, and obsidian chippers as artisans having distinctive titles. With less surety they state that among the Chumash and Gabrieleno the livelihood of makers of plank canoes and soapstone bowls was gained largely from their trades.

These authors also discuss the ownership of quarries with acuteness. In California the ownership was tribal, but related and nearby groups had the right to quarry either freely or on the payment of small gifts. Wars resulted from disputes over ownership or over attempts by distant tribes to use a quarry without payment. On the other hand, the Clear Lake obsidian quarries and the Stonyford salt seepage were neutral ground. The existence of neutral ground at the pipestone quarry of Minnesota and at Flint Ridge, Ohio, is well known. This intertribal arrangement, by which enemies could meet and supply their needs but were prohibited from fighting, affords an apt comment on the importance of flint and other mineral products to the primitive. Our present knowledge of such arrangements stems from historical and ethnological sources. An obvious archaeological objective would be to learn the length of time in which such intertribal agreement or custom has endured.

CONCLUSION

FLINT quarries by reason of their importance in primitive economy deserve renewed study. The study here recorded is all too brief and hurried. The debris of the quarries makes clear that the "blank" as conceived by Holmes is only a discarded bifaced ax which when broken served also as a core for the production of scrapers. The existence in the quarry debris of a multitude of utilized flakes and roughly formed implements suitable for working on wood and bone has been established. Thus these quarries and, by inference, many others were not only sources of flint tools, but also factories for the fabrication of an unknown array of objects of wood and bone.

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